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**BEFORE THE PUBLIC UTILITIES COMMISSION OF THE  
STATE OF CALIFORNIA**

Order Instituting Rulemaking to Examine  
the Commission's Energy Efficiency  
Risk/Reward Incentive Mechanism.

R.09-01-019  
(Filed January 29, 2009)

**SOUTHERN CALIFORNIA EDISON COMPANY'S (U 338-E)**  
**PROPOSAL TO RESOLVE ISSUES IN SCOPE IN COMPLIANCE WITH**  
**ASSIGNED COMMISSIONER AND ADMINISTRATIVE LAW JUDGE'S**  
**AMENDED SCOPING MEMO AND RULING**

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Dated: **March 18, 2016**

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**I. INTRODUCTION**

Pursuant to the Rules of Practice and Procedure of the California Public Utilities Commission (Commission), and in compliance with the *Assigned Commissioner and Administrative Law Judge's Amended Scoping Memo and Ruling*, issued on January 22, 2016 (Scoping Memo), as amended by the *Administrative Law Judge's Ruling Revising Schedule*, issued on February 5, 2016, Southern California Edison Company (SCE) respectfully submits its proposal to resolve the issues of this proceeding. The Commission issued three decisions associated with energy efficiency (EE) for the 2006-2008 program period. Decision (D.) 08-12-009 authorized an interim award of approximately \$24.7 million. The second interim award of \$25.7 million was authorized in D.09-12-045. The Commission's final true-up of savings and earnings in D.10-12-049 found that SCE's 2006-08 EE program portfolio achieved over \$1 billion in net benefits for SCE's customers, resulting in an additional \$24.1 million – a total of \$74.5 million – in shareholder earnings. The Commission in D.15-09-026 ordered rehearing to ensure that “all money awarded by [the 2008, 2009 and 2010 decisions] . . . are just and reasonable and based on calculations verified by the

Commission, via its Energy Division, pursuant to the directives and process adopted in Rulemaking 06-04-010 and Rulemaking 09-10-019 as modified.”<sup>1</sup> The motivation for rehearing is based in part on concerns that the Commission, in D.10-12-049, deviated from the adopted Risk-Reward Incentive Mechanism (RRIM) procedure in finalizing savings and earnings for 2006-08.<sup>2</sup>

In this filing, SCE sets forth its proposal for resolving the rehearing issues. Specifically, SCE proposes that the Commission issue a decision finding that the total earnings for SCE in D.10-12-049 are just and reasonable for the following reasons (in summary):

1. SCE’s 2006-2008 shareholder incentive award totaling \$74.5 million is calculated based on EE savings and net benefits achieved during the program cycle as determined in D.10-12-049, at a reasonable shared savings rate of 7 percent (7%). D.10-12-049 reasonably relies on ex post verified installations from the ex post data in the Energy Division’s 2006-2008 Energy Efficiency Evaluation Report, dated July 2010, and the Scenario Analysis Report, dated July 9, 2010 (collectively the “evaluations”), and declines to adjudicate the myriad of disputes surrounding the remaining ex post data, because of legitimate concerns with the uncertainties arising under the RRIM mechanism itself, the soundness of key elements of the ex post evaluation, and the understandable objective of the Commission to move beyond the controversies surrounding RRIM and the 2006-08 program evaluations to focus on future needs for energy efficiency, including a more predictable and reliable incentive mechanism. The record contains ample support for the Commission’s actions in D.10-12-049 decision, and demonstrates that the Commission was within its discretion to deviate from the adopted RRIM procedure to finally and reasonably dispose of the 2006-08 energy efficiency savings and associated earnings.
2. The Commission has acknowledged some of the errors in the RRIM through the decision adopting the current Efficiency Savings Performance Mechanism (ESPI) mechanism.

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<sup>1</sup> See D.15-09-06, Ordering Paragraph (OP) 6.

<sup>2</sup> See *id.*, pp. 7-8, noting *e.g.*, that the Commission in D.10-12-049 did not use the updated ex ante assumptions and used a 7% shared savings rate for savings of 85%, rather than 9% or 12%.

The current mechanism is designed in part to avoid mistakes of the past RRIM mechanism, which reinforces the prudence of the Commission's actions in D.10-12-049 to deviate from the RRIM and the ex post data in finalizing the 2006-08 savings and shareholder awards.

3. SCE's customers received substantial net benefits from the 2006-2008 programs. D.10-12-049 found that SCE's portfolio achieved over \$1 billion in net benefits, and SCE shared in the savings at a rate of 7%. Even under the Energy Division's very conservative view of savings (and liberal view of costs) of the portfolio, SCE's 2006-08 portfolio achieved nearly \$300 million in net benefits.
4. SCE's \$74.5 million earnings for 2006-08 is 10.5 % of its energy efficiency expenditures for that program cycle, which is squarely in line with the savings and earnings of other utilities across the nation. A 2011 ACEEE study, relied on by the Commission in establishing the ESPI mechanism, found that the average utility earnings for energy efficiency across the nation are 10-11% of expenditures. Moreover, in D.13-09-029 the Commission found that an earnings rate of 10.89% of program budget is appropriate.<sup>3</sup> SCE's 2006-08 earnings award is 11% of its 2006-08 program budget.
5. SCE's 2006-08 energy efficiency savings adopted in D.10-12-049 are in line with SCE's year over year savings over the last 10 years. Moreover, SCE's earnings awarded in D.10-12-049 are in line with earnings over the last 10 years, and particularly under the current ESPI mechanism. SCE earned an average of \$25 million a year for 2006-2008; SCE is on track to earn an average of \$24 million a year for 2013 and 2014 under ESPI.
6. Accounting for flaws in the ex post data produces results supporting the reasonableness of SCE's 2006-08 award. Correcting for just *a handful of errors* in the Energy Division's

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<sup>3</sup> D.13-09-023, Finding of Fact (FOF) 19 at p. 89.

evaluation, including those identified in Natural Resources Defense Council's (NRDC) compelling Reanalysis of the 2006-08 Upstream Lighting Program,<sup>4</sup> more than doubles SCE's earnings under the Energy Division's recommended Scenario 7 from its 2006-08 Scenario Analysis Report. NRDC's Reanalysis casts doubts on the soundness of certain aspects of the Energy Division's evaluation of the 2006-08 portfolio savings, and reinforces the prudence of the actions taken in D.10-12-049 to deviate from the RRIM and the ex post data in finalizing the 2006-08 savings and shareholder awards.

SCE's proposal focuses on D.10-12-049 because it determined the total savings, net benefits, and earnings for the 2006-08 energy efficiency program cycle, and thereby trued-up SCE's interim energy efficiency savings, net benefits and earnings determined in the 2008 and 2009 decisions.<sup>5</sup>

SCE does not support the re-litigation of the 2006-08 earnings, because there is no legal basis for recalculating SCE's earnings, and sufficient bases exist for the Commission to conclude that the earnings are reasonable. This Commission should decline to recalculate 2006-08 awards under a mechanism no longer in use, using ex post data that has been shown to contain errors and downward biases in the evaluation of savings achieved by the 2006-08 programs.

Should the Commission determine there is a legal basis for recalculating SCE's 2006-08 earnings using all of the ex post data in the Evaluation Report, it must for due process reasons allow SCE to submit testimony seeking to account for errors and biases in the Evaluation Report and recalculating its savings and earnings.

These matters are discussed in detail in Section II. SCE's responses to the specific questions set forth in the Scoping Memo are provided in Section III.

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<sup>4</sup> See fn. 7, *infra*.

<sup>5</sup> SCE's total interim award for 2006-08 from D.08-12-009 and D.09-12-045 was \$50.4 million.

## **II. SCE'S 2006-2008 ENERGY EFFICIENCY SAVINGS AND EARNINGS ARE JUST AND REASONABLE**

### **A. The Record Shows No Demonstrated Single Correct Calculation of Savings and Earnings for the 2006-08 Program Portfolios**

The record around D.10-12-049 reveals a proceeding that was robust, gathered substantial input on the facts and policies at issue, and involved a vigorous vetting of the issues among the many stakeholders. The proceeding produced little consensus on the issues, generated three different proposed decisions (PDs), each taking a different approach to the savings calculations and the true-up awards based on a record that supported a variety of potential outcomes, including the one ultimately adopted in D.10-12-049.

The proceedings leading up to D.10-12-049 were contentious because parties had fundamental disagreements over the soundness of the Energy Division's evaluations of the 2006-08 energy efficiency program savings, and the reasonableness of relying on an incentive mechanism whose results were highly sensitive to relatively small changes in the various assumptions and inputs. SCE's positions are well documented that the evaluations contained errors and downward biases, and tended to substantially undervalue the energy efficiency achievements of SCE's 2006-08 portfolio.<sup>6</sup> NRDC and the other investor-owned utilities (IOUs) had similar, well-documented concerns with Energy Division's evaluations and the RRIM mechanism.<sup>7</sup> The Office of Ratepayer Advocates (ORA) and The Utility Reform Network (TURN) supported the evaluations and the use of RRIM despite the well-documented concerns over technical errors and downward biases in professional judgment.

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<sup>6</sup> See e.g., SCE's May 17, 2010 Comments on the Energy Division's Draft 2006-08 Energy Efficiency Evaluation Report, concerning flawed studies that contain small sample sizes, low confidence intervals, poor precision estimates; use of a new version of DEER that was not publicly released or vetted by parties; systematic and significant technical errors; reliance on a complex, non-transparent Evaluation Reporting Tool (ERT) that produces incorrect results; errors in calculating the 2006-08 program energy efficiency savings and net benefits.

<sup>7</sup> The 2011 reanalysis by NRDC of the Energy Division's evaluation of one key program in the 2006-08 portfolio, which is discussed in Section II.F herein and attached as **Attachment A** hereto, reveals some of the key errors and downward biases that resulted in substantially undervaluing the 2006-08 portfolio savings.



The range of possible and proposed outcomes in the record is vast, from unprecedentedly low energy efficiency savings across the state, to earnings payments as high as \$450 million for all of the utilities. The Energy Division published over 50 distinct scenarios that calculated a range of 2006-08 savings and earnings from less than \$1 million to almost \$400 million.<sup>8</sup> These scenarios “illustrated the sensitivity of RRIM [savings and] earnings over a range of different policy assumptions”<sup>9</sup> calculated utilizing the Energy Division’s Evaluation Reporting Tool. Scenario 7, recommended by Energy Division in its July 9, 2010 Scenario Analysis Report, resulted in very low estimates of savings and net benefits (3,731 GWh, 708 MW and nearly \$300 million in net benefits), and SCE total earnings of \$26.8 million.<sup>10</sup> The Joint IOU Scenario resulted in 2,836 GWh and 535 MW of energy efficiency savings, \$753 million in net benefits and \$90 million earnings for SCE.<sup>11</sup>

The record demonstrates no single correct answer for the 2006-08 savings and earnings, and underscores a fundamental flaw with RRIM: the mechanism created unanticipated, tremendous uncertainty from ex ante to ex post information (a flaw affirmatively avoided in subsequent mechanisms), which made it nearly impossible for the utilities to appropriately plan for and meet the goals. This flaw raised fundamental fairness issues in relying on the mechanism to finalize the 2006-08 savings and earnings, and justified some deviations in the interest of fairness.

The Commission found these fairness concerns compelling, and ultimately agreed that deviations were warranted. Indeed, each of the three proposed decisions (PDs) to finalize the 2006-08 savings and earnings justified deviations from the mechanism. For example, ALJ Pulsifer’s PD, which was issued September 28, 2010, incorporated 100% of Codes and Standards net benefits, incorporated some measure of cumulative savings goals, and reduced therm savings goals for

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<sup>8</sup> See ALJ Pulsifer’s September 28, 2010 PD, p. 14.

<sup>9</sup> See ALJ Pulsifer’s September 28, 2010 PD, p. 13.

<sup>10</sup> See July 9, 2010 Scenario Analysis Report, p. 52.

<sup>11</sup> See D.10-12-049, pp. 21-22. The Joint IOU proposal applied a 12% shared savings rate in accordance with D.09-12-045; did not compare energy savings against 2004-2008 cumulative goals; included 100% of the savings from 2006-2008 C&S activities; and applied *ex ante* values for NTG ratios, Expected Useful Life (EUL), In-Service Rates (ISR) for upstream-delivered Compact Fluorescent Light bulbs (CFLs), and Interactive Effects as found in the 2005 DEER.

interactive effects –changes along the lines of those supported by the IOUs and NRDC – but otherwise espoused Scenario 7’s liberal view of costs and conservative view of savings from the 2006-08 programs, resulting in zero penalties or additional earnings.<sup>12</sup> Assigned Commissioner Bohn’s alternate PD, also issued on September 28, 2010, went further by deviating from the RRIM’s use of ex post data in order to address fairness concerns:

“We are faced with widely varying proposals for the final true up incentive payments. Scenarios prepared by the Energy Division show potential incentive payments ranging from \$450 million for all utilities combined, to negative amounts reflecting penalties for some utilities. Similarly, parties’ proposals for final incentive payments, and for the assumptions and methodologies underlying those payments, differ significantly. While we conclude that relying solely on old ex ante assumptions to evaluate program performance is inappropriate, we also recognize that the ex post assumptions presented by the Energy Division, while the best available information, have inherent uncertainty and imprecision. Many factors such as [net to gross] ratios are difficult to measure and require application of judgment, as does determination of the split between residential and non-residential installation of [compact fluorescent bulbs (CFLs)]. While the calculation of incentives was originally assumed to be ministerial, it has instead turned out to be extremely contentious.

Not only are there disagreements regarding the ex post estimates provided by Energy Division, there are also a number of process modifications that have been presented for Commission consideration that also could impact the results of the incentive calculations. These considerations are not ministerial nor are they solely in relation to determining actual, measurable energy efficiency savings. Instead, they raise issues such as the appropriate level of 2004-05 data to include; whether or not to update GHG and avoided cost values; whether Energy Division’s change to a High Impact Measure approach is appropriate, whether or not to include interactive effects not considered in the original mechanism, whether to include savings from CFLs purchased in 2006-07 but not installed till later and what level of savings from Codes and Standards are appropriate to include in the calculations.

All of these raise a concern regarding the reasonableness of using an incentive mechanism whose results can change dramatically due to relatively small changes in any of the above mentioned assumptions or processes. We conclude that we cannot simply blindly apply the approved mechanism without taking into consideration the uncertainty of the assumptions and the impact of potential changes to the process. What the record shows is that there is not a demonstrated single correct answer for the amount of incentive to be paid to the utilities.”<sup>13</sup>

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<sup>12</sup> See ALJ Pulsifer’s September 28, 2010 PD, p. 3.

<sup>13</sup> See Assigned Commissioner Bohn alternate PD, issued September 28, 2010, pp. 52-53.

Assigned Commissioner Bohn's alternate PD preceded President Peevey's alternate PD – which was ultimately adopted by the Commission – by more than six weeks.<sup>14</sup> Although each of these alternate PDs took similar approaches in deviating from a strict application of RRIM in the interest of fairness, Assigned Commissioner Bohn's PD would have awarded *greater earnings*, for a total of \$ 77.5 million for SCE, or \$3 million more than approved in D.10-12-049.<sup>15</sup>

The last sentence from the quote of Commissioner Bohn's PD (above) is key to the present reasonableness review of the earnings approved in D.10-12-049: *the record demonstrated no single correct answer for the total energy efficiency savings and incentive earnings achieved by the 2006-08 program portfolios*. This conclusion is underscored by the fact that three different PDs issued to resolve the matter. Each PD deviated from RRIM and the Energy Division's evaluations to some degree. The Commission had to exercise judgment in finalizing the 2006-08 savings and earnings. It had to consider the considerable controversy over the soundness of the Energy Division's evaluations, and the questions of fairness in relying on an incentive mechanism whose results were highly sensitive to relatively small changes in the various assumptions and inputs, was prone to wide variances from ex ante to ex post savings, and did not fairly permit the utilities to adjust their portfolios to meet goals based on ex post data.

The Commission in D.10-12-049 ultimately took a middle of the road approach to the potential outcomes between ALJ Pulsifer's PD, which proposed zero additional incentives, and Assigned Commissioner Bohn's alternate PD, which would have awarded more incentives than D.10-12-049. A middle of the road approach, in and of itself, can be viewed as a reasonable under the circumstances. Moreover, a middle of the road approach tends to undercut concerns that the process leading to the decision was somehow tainted. The Commission could have awarded high earnings under Assigned Commissioner's PD, or it could have espoused the very conservative estimate of achievements and savings under ALJ Pulsifer's PD. The Commission ultimately took a

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<sup>14</sup> Assigned Commissioner Bohn issued his alternate PD to ALJ Pulsifer's on September 28, 2010, and a revised version on October 19, 2010. President Peevey's alternate PD issued November 16, 2010.

<sup>15</sup> See Assigned Commissioner Bohn alternate PD, issued September 28, 2010, pp. 4, 11.

*similar but more conservative approach* to Assigned Commissioner Bohn’s PD, issued many weeks before the President Peevey PD that resulted in D.10-12-049. Under the circumstances, D.10-12-049 reasonably resolved the 2006-08 program portfolio savings and earnings.

**B. The Commission Acted Within Its Reasonable Discretion in Deviating from RRIM in Resolving the 2006-08 Savings and Earnings Claims**

The Commission was well within its discretion in deviating from the RRIM and the Energy Division’s evaluations in D.10-12-049 to achieve a just and reasonable outcome. The Commission has the discretion to deviate from previous decisions upon notice to the parties, when reason dictates. Public Utilities Code Section 1708 provides:

“The commission may at any time, upon notice to the parties, and with opportunity to be heard as provided in the case of complaints, rescind, alter, or amend any order or decision made by it. Any order rescinding, altering, or amending a prior order or decision shall, when served upon the parties, have the same effect as an original order or decision.”

Parties had ample notice with the issuance of the three PDs in 2010 – each of which deviated from RRIM and the Energy Division’s evaluations to some degree – and the opportunity to publicly comment on each PD. As such, the Commission in D.10-12-049 had the discretion to deviate from its previous decisions that the true-up of savings and earnings for 2006-08 should be based on information verified by the Energy Division, when the soundness of the verification analysis was called into serious question. Nothing in the record of the consolidated proceedings, including in D.15-09-026 ordering rehearing for purposes of this reasonableness review, demonstrates any legal error on the part of the Commission in finalizing the 2006-08 energy efficiency savings and earnings.

D.10-12-049 contains an extensive discussion of the record, and findings of fact and conclusions of law regarding the controversies over RRIM and the question of fairness of strictly applying RRIM under the circumstances, particularly given the unanticipated, wide variances from ex ante to ex post assumptions and parameters. Some of the most significant controversies with the Energy Division’s Evaluation Report involved incremental measure cost (IMC), net-to-gross (NTG) and expected useful life (EUL) values, and interactive effects. Timing issues around the ex post information also raised

questions of fairness in expecting the utilities should have responded to these updates with substantial modifications to their portfolios. Therefore, similar to the approach in Assigned Commissioner's Bohn's alternate PD, the Commission in D.10-12-049 declined to adjudicate these ex post parameters, and instead modified the incentive mechanism to calculate the incentive levels using ex post installation rates, and base other parameters on ex ante information used to establish the 2006-08 goals, explaining through an extensive analysis partially excerpted below:

“In D.08-01-042, the Commission endorsed the idea that failure to update the ex ante assumptions may create a perverse incentive for utility program managers to exaggerate savings assumptions during the portfolio planning process. While such an incentive may exist absent updating, on further reflection this theory failed to account for the fact that the utility portfolios are submitted for review and approval by the Commission with extensive opportunity for feedback from stakeholders. Consequently, any claims by the utilities regarding the cost effectiveness or savings potential of their portfolios are expressly subject to Commission review. . . .

Over the 2006-2008 period there has been profound disagreement on the appropriateness of the various adjustments to many of the underlying assumptions and parameters driving the estimated performance of the utility programs. In our view, however, these disputes raise a fundamental question regarding the fairness in how the mechanism, originally adopted in D.07-09-043, actually operates. In particular, the intense debate over factors like the net to gross ratios, measure expected useful life, and the residential/non-residential installations of incented lighting products under the utilities' upstream lighting programs, has caused us to consider whether the incentive mechanism appropriately rewards or penalizes the utilities for things that could be reasonably anticipated or are within their control. . . .

An argument has been made that because of the ongoing EM&V activities of Energy Division, the utilities had ample information available to them regarding changes in some of the key underlying assumptions. In light of that information, some parties argue, the utilities could and should have modified their portfolios accordingly. As an example, prior to the incorporation of formal updates to DEER in October of 2008, draft EM&V studies of the 2004-2005 energy efficiency programs were made available to parties. Those draft EM&V studies indicated, among other things, that NTG values for lighting were declining. A legitimate argument may be made that these results could be reasonably deemed final, and actionable, in October of 2007, when the 2004/2005 Statewide Residential Retrofit Single-Family Energy Efficiency Rebate Evaluation (Itron Report) was published. However, an equally valid point is that prior to that date, these updated assumptions were merely preliminary and subject to additional review by parties and the Energy Division, they were not final and, thus, not actionable.

The IOUs argue that the NTG updates in the Energy Division Verification Report are fundamentally flawed, and, even if correct, occurred too late in the 2006-2008 cycle to

enable the IOUs to make meaningful mid-course adjustments in program funding in response to the updated NTG ratio. By way of example, for PG&E's programs, allocations of incentives to upstream lighting manufacturers/distributors must be made at least 120 days prior to the movement of the products into the marketplace. Therefore, the IOUs argue, the October 2007 report, even were they to accept them as accurate, allowed little time for adjustments to program delivery and implementation to take hold during the 2006-2008. They further argue that it is inappropriate to apply these NTG values to the entire 2006-2008 program cycle for purposes of awarding incentives. We agree. . . .

[Our] review establishes that one of the fundamental premises on which the incentive mechanism adopted in D.07-09-043 was based was fundamentally flawed. Specifically, it was/is unreasonable to expect the utilities to anticipate the very substantial changes in a number of the key parameters over the three year cycle that drive their energy efficiency program results. Furthermore, given the after-the-fact timing of Energy Division's updates to these parameters, we find that the IOUs did not have the opportunity to modify their portfolios on the basis of this updated information in a way that would allow them to substantially avoid the adverse impacts of those updated assumptions on estimated program performance. Irrespective of the accuracy of the updates adopted by Energy Division, we find that the incentive mechanism as implemented was/is unfair to the utilities, in that it bases its results on assumptions the utilities cannot be reasonably expected to anticipate; and further, when those changed assumptions come to light, cannot be reasonably expected to respond to in a way that enables them to substantially avoid the adverse impacts on the estimated performance of their programs.

A more reasonable approach to assessing the 2006-2008 period for purposes of determining utilities' energy efficiency program performance and the associated incentive earnings is to rely on ex ante assumptions. These were the assumptions the utilities used in developing the portfolios that the Commission approved in D.05-09-043 for the 2006-2008 cycle."<sup>16</sup>

The ex ante information relied on by D.10-12-049 was based on ex post measured savings from the 2004-05 program cycle, and the Database for Energy Efficient Resources (DEER) 2004-05 ex ante update, overseen by the Energy Division.<sup>17</sup>

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<sup>16</sup> D.10-12-049, Section 5.3, *Ex Ante Versus Ex Post Measures for Measuring Savings*, excerpts from pp. 34 – 41.

<sup>17</sup> See e.g., September 10, 2004 Energy Division Letter to Program Administrators/Implementers, clarifying that "the evaluations of the 2004-2005 programs are to be independent arms-length evaluations conducted by Commission approved evaluation contractors. To facilitate the evaluation contracting process, the Commission has permitted program administrators/implementers to serve as the contracting agents for these evaluations. The Commission construes this role of contracting agent as one involving contractor administration primarily for payment purposes"

The Commission in D.10-12-049 took the additional step to lower the performance earning basis from 9% and 12% levels in RRIM to a 7% shared savings rate, explaining:

“By using a reduced shared savings rate, the IOUs’ potential earnings under the incentive mechanism shall be reduced relative to the mechanism adopted in D.07-09-043. This approach is consistent with the views expressed by DRA and TURN in the context of proposed reforms to the RRIM. Both DRA and TURN have argued that should the Commission modify the RRIM in a way that reduces the risk to the utilities and increases the risk born by ratepayers, that corresponding changes should be made to the shared savings rate and incentive cap. We agree with the thrust of these arguments and find they are equally applicable in the context of modifications to the incentive mechanism as it applies to the 2006-2008 period.”<sup>18</sup>

Exercising its judgment in D.10-12-049 to deviate from a strict application of RRIM in the interest of fairness is well within the Commission’s discretion, is supported by an extensive analysis of the record, and is reasonable under the circumstances described therein.

**C. SCE’s Award Is Reasonable in Light of Utility Shareholder Earnings Across the Country and Recent Earnings Under the New ESPI Mechanism**

The 2006-08 savings and awards for SCE are reasonable in light of SCE’s subsequent performance. In each year since 2006, SCE exceed its energy and demand savings goals, as shown in the table below.<sup>19</sup> The 2006-08 program cycle savings approved in D.10-12-049 are entirely consistent with the savings achieved since then.

The 2006-08 program cycle earnings approved in D.10-12-049 are also consistent with the earnings achieved since 2006. SCE has earned an average of \$20.7 million per year in shareholder incentive awards, and based on performance to date is expected to earn an average of \$23.8 million per year in shareholder incentives under the new ESPI mechanism.

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<sup>18</sup> D.10-12-049, pp. 43-44.

<sup>19</sup> It should be noted that SCE’s goals for 2006-08 were cumulative over the three year cycle. For purposes of this comparative analysis, SCE broke the 2006-08 goals into annual amounts. The data in the table for 2006 should not be read as indicating that SCE missed its goals because it did not have annual goals for that cycle. Rather, the information in the table it is intended to facilitate the comparison of savings and earning each year over the last 10 years, to demonstrate that SCE’s savings and earnings in 2006-08 are not anomalous but rather very consistent with savings and earnings in subsequent years under different mechanisms.

SCE EE Earnings 2006-2014								
Program Year	Earnings Mechanism	Annual Gross Savings		Goal Achieved (%)		Expenditures (\$ Millions)	Award (\$ Millions)	Awards to Expenditures (%)
		GWh	MW	GWh	MW			
2006	RRIM	797.9	134	87%	65%	132.4	24.7	19%
2007	RRIM	1,630.00	267	156%	122%	259.2	25.7	10%
2008	RRIM	1,692.00	345	145%	140%	311.4	24.1	8%
2009	Modified (7%)	1,704.00	317	143%	127%	228.7	18.1	8%
2010	Management Fee (5%)	2,236.00	430	200%	175%	273.8	15.1	6%
2011	Management Fee (5%)	1,419.00	261	128%	107%	340.9	18.6 <sup>A</sup>	5%
2012	Management Fee (5%)	1,744.00	316	160%	132%	314.9	12.1 <sup>B</sup>	4%
2013	ESPI	1,145.10	192.7	124%	106%	192.8	21.2	11%
2014	ESPI	1,216.10	211.4	132%	119%	315.4	26.5 <sup>C</sup> (estimated)	8%

<sup>A</sup> Includes \$5,005,528 holdback granted to SCE in D.15-11-004.

<sup>B</sup> Includes \$1,239,986 holdback granted to SCE in D.15-11-004.

<sup>C</sup> Based on 2014 Part 1 Earnings of \$12,090,772 and estimated Part 2 Earnings of 14,369,811. The Commission will adopt 2014 Part 2 Earnings for the IOUs in 2016.

The 2006-08 earnings are also reasonable in light on average utility earnings for energy efficiency savings across the U.S. In its 2013 decision adopting the current ESPI mechanism, the Commission cited a 2011 American Council for an Energy-Efficient Economy (ACEEE) nationwide survey of efficiency incentives in various states found that shareholder incentives incentive earnings range from 5% to 20% of program spending, with average incentives levels at 10-11% of program expenditures.<sup>20</sup> The Commission itself, in adopting the new ESPI mechanism in 2013, considered the data from the ACEEE study and concluded as a matter of judgment that earnings of 10.85% of energy efficiency budgets are appropriate for shareholder incentives:

“We agree with NRDC’s observation that in general, the harder it is to reach an earnings limit, the larger the earnings limit should be. Similarly, a smaller earnings potential is warranted to the extent it is easier to reach. Incentive earnings should thus be sufficient to spur excellent performance at meeting the Commission’s objectives. At the same time, earnings limits should remain within reasonable expectations. Accordingly, to provide a broader perspective, we set the overall incentive earnings potential in relation to targeted

<sup>20</sup> See D.13-09-023, p. 25, noting that “most of the states surveyed award incentives based on performance at saving energy and lowering customer bills, and not based on how much money is spent. Incentives as a percent of spending, however, provide a consistent point of comparison across states.”



goals at high levels of performance, while also calculating the estimated savings awards that the IOUs might expect if performance simply remains at present levels, referred to as “business as usual.” We also assess incentive earnings potential in the context of all four categories of incentive performance offered through the ESPI mechanism. Based on target performance goals, and the management fees described below, we conclude that the two-year ESPI incentive earnings potential equal to 10.85% of the EE portfolio budget is appropriate. We set this earnings level as a matter of judgment, taking into account the earnings potential and associated risks relating to incentives offered during prior cycles, and in comparison to earnings for incentive programs offered in other state jurisdictions. Setting maximum earnings potential at nearly 11% of budgeted funds offers earnings within the range of earnings offered by other state jurisdictions.”<sup>21</sup>

SCE’s 2006-2008 earnings amounts to 10.5% of program expenditures for the cycle, and 11% of the 2006-08 program budget,<sup>22</sup> which is squarely within the average range of earnings across the nation, and the earnings potential found appropriate by the Commission, while exceeding then savings goals for the program cycle.

**D. Ratepayers Received Substantial Benefits from SCE’s 2006-2008 Program Portfolio**

SCE’s customers received significant benefits from SCE’s 2006-2008 EE programs that justifies the shareholder incentives authorized for that period. D.10-12-049 found that SCE’s portfolio achieved over \$1 billion in net benefits, and SCE shared in the savings at a rate of 7%. Even under the Energy Division’s very conservative view of savings (and liberal view of costs) of the portfolio, SCE’s 2006-08 portfolio achieved nearly \$300 million in valuable, cost-effective preferred resource net benefits to SCE’s customers.

**E. The Commission in the Current Efficiency Savings and Performance Incentive (ESPI) Mechanism Corrected Some of the Deficiencies of RRIM, Reinforcing the Reasonableness of its Actions in D.10-12-049 to Deviate from RRIM in the Interest of Fairness**

As previously indicated, the Commission in D.10-12-049, acknowledged the fundamental concerns with the RRIM, stating for example:

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<sup>21</sup> *Id.*, pp.26-27 and FOF 19 at p. 89.

<sup>22</sup> SCE’s 2006-08 program budget was \$674.8 million. *See* D.05-09-043, p. 4.

“For the 2006-2008 portfolios, the estimated incentive earnings the utilities would have earned if their programs were evaluated on the basis of ex ante assumptions would have been \$307 million. Yet changes in the underlying parameters result in collective earnings declining to minus \$45 million, a swing of \$353 million in incentives.... The Commission itself failed to reasonably anticipate the magnitude of the dramatic changes to the parameters underlying its assessment of energy efficiency program performance and the huge swings this would cause in the incentive calculations.”<sup>23</sup>

As a result, the Commission issued Rulemaking (R.) 12-01-005 to improve the shareholder incentive mechanism. The efforts in R.12-01-005 culminated in the issuance of D.13-09-023, which made significant structural changes to improve the shareholder incentive mechanism. For example, a broader range of policy goals accounts for potential earnings: 1) EE resource savings, 2) ex ante review performance, 3) building codes and standards EE programs, and 4) non-resource programs. Moreover, to address the significant issues with the previous mechanism in terms of verified resource savings, the new ESPI mechanism greatly limited the risk of variances from ex ante to ex post. Ordering Paragraph 3 of D.13-09-023 states:

“An incentive is offered to encourage energy efficiency resource savings, paid as a combination of ex ante “locked down” and ex post verified units of savings results, according to the level of uncertainty of the measures for which savings are being claimed.”<sup>24</sup>

In other words, the ESPI mechanism vastly improves upon RRIM because it appropriately includes incentives for longer-term but less immediately measurable energy savings from non-resource programs, as well as ex ante based resource programs with more certain savings. As discussed in Section II.C above, SCE’s earnings for 2013 and 2014 are expected to average \$24 million per year under the new ESPI mechanism. These earnings are completely line with the earnings authorized for the 2006-2008 program period. Thus, under a mechanism that corrects for some of the errors in the RRIM, SCE’s earnings for 2006-2008 and 2013-2014 are very comparable, which tends to reinforce the prudence of the actions taken in D.10-12-049 to deviate from the RRIM and the ex post data in finalizing the 2006-2008 savings and earnings.

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<sup>23</sup> D.10-12-049, pp. 39-40.

<sup>24</sup> D.13-09-023, p. 94.

**F. Accounting for Flaws in the Ex Post Data Produces Results that Support the Reasonableness of SCE's 2006-08 Award**

In 2011, NRDC undertook a peer-reviewed<sup>25</sup> reanalysis of the 2006-2008 Upstream Lighting Program (ULP) to “first and foremost develop a more accurate and representative estimate of the impacts of the Upstream Lighting Program.” Documented in Reanalysis of the 2006-2008 Upstream Lighting Program (July 20, 2011), by NRDC Senior Scientist Peter Miller, the reanalysis was motivated by concerns that the Upstream Lighting Program “was a far bigger success than the CPUC’s staff evaluation indicates.” The Reanalysis presents compelling evidence of “errors and biases in estimates for incremental measure costs, net-to-gross ratio (NTGR), and installations” that resulted in “an erroneously large estimate of program costs and extremely low estimate of program costs.” When corrections for these three areas are made, “net benefits increase by over \$1 billion . . . with \$7 in benefits in energy savings and pollution reductions for every \$1 invested.”<sup>26</sup>

The Reanalysis, summarized below and attaches hereto as Attachment A, is compelling in its revelation of the errors and biases in the ED’s evaluation, which are at the very heart of the controversy surrounding the calculation of 2006-2008 savings and earnings. The Reanalysis convincingly corroborates the well-documented concerns of NRDC and the IOUs that the Evaluation Report cannot be relied on to reasonably calculate 2006-2008 savings and earnings, and resoundingly supports the reasonableness of the Commission’s actions in D.10-12-049.

The Reanalysis identifies the following errors and downward biases in the ED’s evaluation of the program:

1. Incremental Measure Cost (IMC). According to Commission policy rules, the IMC is used to calculate Total Resource Cost of the program, and is the difference in cost

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<sup>25</sup> See *A Brighter Idea: The Untold Story of the CFL*, The Electricity Journal, Volume 25, Issue 7, August–September 2012, Pages 56-64 by Peter Miller, Senior Scientist, NRDC. A copy of this article can be found in three parts on the NRDC’s “Switchboard” website. Part 1 is available at [http://switchboard.nrdc.org/blogs/pmiller/a\\_brighter\\_idea\\_the\\_untold\\_sto.html](http://switchboard.nrdc.org/blogs/pmiller/a_brighter_idea_the_untold_sto.html), Part 2 is available at [http://switchboard.nrdc.org/blogs/pmiller/a\\_brighter\\_idea\\_the\\_untold\\_sto\\_1.html](http://switchboard.nrdc.org/blogs/pmiller/a_brighter_idea_the_untold_sto_1.html), and Part 3 is available at [http://switchboard.nrdc.org/blogs/pmiller/a\\_brighter\\_idea\\_the\\_untold\\_sto\\_2.html](http://switchboard.nrdc.org/blogs/pmiller/a_brighter_idea_the_untold_sto_2.html) [as of March 18, 2016].

<sup>26</sup> See Reanalysis, **Attachment A** hereto, p. 1.

between the EE measure and the comparable non energy-efficient measure. In the case of the Upstream Lighting Program, the IMC was substantially negative, because the program dramatically reduced the cost of the CFL to below the cost of the comparable non energy-efficient incandescent bulb. Rather than use the incremental cost of the CFLs, the ED's evaluation used the much higher total cost of the CFLs rebated through the program. This "error" results in a substantial overestimate of the total program costs: "[t]he difference between the staff calculation and one that accurately accounts for incremental measure costs is \$319 million" as it lowers TRC by that amount, and results in increased net benefits of the program by "a commensurate \$319 million."<sup>27</sup>

2. Net-to-Gross Ratio (NTGR): According to Commission policy rules, the calculation of program benefits only includes energy savings from CFL sales beyond what would have occurred absent the program. The Reanalysis states that "perhaps the biggest issue arising from the ULP Evaluation Report is the estimate of" the NTGR: the Evaluation Report acknowledges that it produced no NTGR results representative of the 2006-2008 program; thus, it based the NTGR on the consultant's "best judgment," which was that the program accounted for 54% of the savings in the market -- a substantial reduction from the ex ante NTGR assumption of 80% for the program. The Reanalysis provides a blisteringly persuasive evaluation of why the 54% NTGR is "unsupported by readily available evidence," which evidence includes analysis contained in the Evaluation Report itself. The Reanalysis concludes that a NTGR of 1.00 is more representative of the ULP's impact on the market, increasing total program benefits by over \$800 million.<sup>28</sup>
3. Post 2008 Installations. According to Commission policy rules, utilities should be credited with savings from measures installed during the program cycle. The ULP

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<sup>27</sup> See Reanalysis, pp. 6-8.

<sup>28</sup> See *id.*, pp. 8-15.

evaluation interpreted this rule to count the costs but exclude the savings of those CFLs rebated through the program but installed after 2008. This meant that the benefits of 28.6 million CFLs were excluded (though their costs included), for more than \$230 million reduction in total benefits.

Accounting for errors and biases in the Energy Division's Evaluation Report demonstrates the reasonableness of SCE's 2006-2008 earnings. SCE adjusted Energy Division's Scenario 7 to use the NTGR and the IMC from the NRDC Analysis. SCE did not adjust for post-2008 installations, because those were counted in savings and earnings for 2009 and 2010. SCE also made the following additional corrections or adjustments to Scenario 7, focusing on the ULP and another key residential program in SCE's 2006-08 portfolio, the Appliance Recycling Program (ARP). These corrections only address three of the more significant errors in the Evaluation Report:

- Adjusted the ULP's Unit Energy Savings (UES) to correct for errors in the Evaluation Report's estimates of (i) watt savings by comparing installed CFLs with installed other bulbs, rather than correctly comparing installed CFLs with the bulbs that were replaced by CFLs, based on the CLASS Study<sup>29</sup>; and (ii) hours of operation based on program CFLs only, rather than on the total population of program CFLs and non-program CFL accounted for in the Evaluation Report itself.
- Adjusted the residential to non-residential split in CFLs based on a larger sample phone survey in the Evaluation Report itself.<sup>30</sup>
- Adjusted the NTGR for the ARP from 56% to 60% to account for the downward bias in the Evaluation Report's reliance on the average of participating and non-participating customer responses, rather than on the non-participating customer responses accounted

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<sup>29</sup> 2005 California Statewide Residential Lighting and Appliance Efficiency Saturation Study, RLW Analytics, August 23, 2005, *available at* [http://calmac.org/publications/2005\\_CLASS\\_FINAL\\_REPORT\\_v3.pdf](http://calmac.org/publications/2005_CLASS_FINAL_REPORT_v3.pdf) [as of March 18, 2016].

<sup>30</sup> Residential CFLs reduced from 31.8m to 28.6m; non-residential CFLs increased from 3.5m to 6.7m.

for in the Evaluation Report itself. A 60% NTGR is what the Energy Division applies to the current ARP.<sup>31</sup>

These handful of corrections for just two programs in SCE's portfolio more than doubles the earnings calculation of ED's recommended Scenario 7. SCE's earnings under Scenario 7 increase from \$26.8 million to over \$54 million, resulting in a 91% average goal performance rate. The result supports the reasonableness of SCE's 2006-08 earnings, because it demonstrates that correcting for clear errors and accounting for downward biases in the Energy Division's evaluations substantially increases the savings and potential earnings. Evidence like the NRDC Reanalysis raises reasonable doubt about the soundness of the overall Evaluation Report, and reinforces the reasonableness of the Commission's actions in D.10-12-049.

SCE does not support the re-litigation of the 2006-2008 earnings, because there is no legal basis for recalculating SCE's earnings, and sufficient bases exist for the Commission to conclude that the earnings are reasonable. In light of evidence such as that contained in the NRDC Reanalysis, if the Commission determines a legal basis for recalculating SCE's 2006-2008 earnings using all of the ex post data in the Evaluation Report, it must for due process reasons allow SCE to submit testimony seeking to account for error and biases in the Evaluation Report, and recalculating savings and earnings. Any other process would be prejudicial and suspect.

**G. The Commission Must Resolve Material Disputes Over 2006-08 Ex Post Data If It Concludes that a Legal Basis Exists for Recalculating Earnings Using Such Data**

As stated above, SCE does not support the re-litigation of the 2006-2008 earnings, because there is no legal basis for recalculating SCE's savings and earnings, and sufficient bases exist for the Commission to conclude that the savings and earnings adopted in D.10-12-049 are reasonable. In light of the well-documented concerns with 2006-08 portfolio evaluations, if the Commission determines a

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<sup>31</sup> Appliance Recycling Program Impact Evaluation Report, prepared by KEMA, Inc., October 24, 2014, Table 3, p. 6, available at [http://www.calmac.org/publications/2010-2012\\_ARP\\_Impact\\_Evaluation\\_Final\\_Report.pdf](http://www.calmac.org/publications/2010-2012_ARP_Impact_Evaluation_Final_Report.pdf) [as of March 18, 2016].

legal basis for recalculating SCE's 2006-2008 earnings using all of the ex post data in the Energy Division's Evaluation Report, it must for due process reasons allow SCE to submit testimony seeking to account for error and biases in the Evaluation Report, and recalculating savings and earnings, followed by evidentiary hearings on material facts in dispute and legal briefs. Of particular concern for SCE are the NTG, IMC and EUL values, and interactive effects values contained in the Energy Division's evaluations.

### **III. SCE'S RESPONSES TO SCOPING MEMO QUESTIONS**

**A. Did the Energy Division's "2006-2008 Energy Efficiency Evaluation Report" or a scenario in the "2006-2008 Energy Division Scenario Analysis Report" correctly implement the relevant directives of the Commission? Are there additional relevant documents in which Energy Division has verified calculations that implement these directives?**

No. Neither the Evaluation Report nor the Scenario Analysis Report correctly implemented the relevant directives of the Commission, because neither verified calculations that implement these directives. This is because the completed analyses were not based on the program evaluation method required by the Commission in D.07-09-043,<sup>32</sup> but a new and untested approach called "High Impact Measure" (HIM) analyses. As described at great length during the proceeding, the HIM analyses were flawed and resulted in unreliable studies due to many factors including inadequate study design, inadequate data collection due to time pressures, extensive substitution of speculative engineering analysis for actual ex post data collection and energy usage data, and inaccurate data caused by the lengthy delays between measure installations and data collection. As such, D.10-12-049 correctly did not rely on these studies to calculate the final true-up payment, noting "...substantial, controversial, and unanticipated swings... in evaluation studies."<sup>33</sup> D.10-12-049 relied on ex ante estimates derived from

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<sup>32</sup> D.07-09-043, OP 9 at pp. 223-224.

<sup>33</sup> D.10-12-049, p. 4.

ex post measured savings from the 2004-05 program cycle, and the DEER 2004-05 ex ante update, overseen by the Energy Division.<sup>34</sup>

There are no additional documents in which Energy Division verified calculations that implemented the relevant Commission directives around program impact evaluations.

**B. Are incentive payments based on the calculations in the Energy Division’s “2006-2008 Energy Efficiency Evaluation Report,” a scenario in the “2006-2008 Energy Division Scenario Analysis Report,” or other document identified in response to Question 1, just and reasonable? If not, how and why should they be adjusted to a just and reasonable level?**

No. None of those documents provide a just and reasonable approach to determining the incentive payments. The incentive payments were already adjusted to a just and reasonable level by D.10-12-049, and as discussed in this Proposal, no further adjustment is necessary.

**C. If the just and reasonable incentive payments determined in Question 2 require a refund, how should that refund be implemented?**

As discussed herein, there is no legal basis for undoing the final savings calculations and earnings adopted in D.10-12-049 and/or ordering refunds. Should the Commission determine there is a legal basis for recalculating SCE’s 2006-08 earnings award using the ex post information in the Energy Division’s 2006-08 portfolio evaluations, it should only do so after testimony, evidentiary hearings and legal briefs on the disputes over this ex post information. Any refunds ordered in a final decision adjudicating these disputes should be provided as an offset to future energy efficiency incentive awards, consistent with D.07-09-043, which directs with respect to RRIM earnings that “[a]ny pay-back obligations that might arise in the final true-up claim should be booked against positive earnings in the

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<sup>34</sup> See fn. 17, *supra*.



next energy efficiency program cycle, and not be consolidated with other electric distribution or gas transportation rate changes for the next scheduled change.”<sup>35</sup>

#### **IV. CONCLUSION**

SCE appreciates the opportunity to provide this proposal to resolve the issues of this proceeding. For the reasons discussed herein, the Commission should decline to recalculate 2006-2008 awards under a mechanism no longer in use, using ex post data that has been shown to contain serious errors and downward biases in the evaluation of savings achieved by the 2006-2008 programs. Better benefits can be achieved for California and SCE’s customers if the Commission and stakeholders dedicate their resources to collaborating on current challenges and future needs, including substantially increasing energy efficiency to meet critical climate challenges and California’s greenhouse gas (GHG) emission reduction goals. The Commission in D.10-12-049 reasonably determined the total savings, net benefits and earnings for SCE’s 2006-08 energy efficiency program portfolio. As such, SCE recommends that the Commission find that SCE’s earnings for the 2006-08 period are just and reasonable.

Respectfully submitted,

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<sup>35</sup> D.07-09-043, Conclusion of Law (COL) 16 at p. 218.

**Attachment A**

***Reanalysis of the 2006-2008 Upstream Lighting Program (July 20, 2011)***

**NRDC Senior Scientist Peter Miller**

# Reanalysis of the 2006-08 Upstream Lighting Program

Peter Miller, Senior Scientist  
Natural Resources Defense Council  
July 20, 2011

## Executive Summary

From 2006 to 2008, California residents purchased over 90 million heavily discounted compact fluorescent lamps, through an initiative administered by the state's investor-owned electric utilities and overseen by the California Public Utilities Commission (CPUC) known as the Upstream Lighting Program (ULP). This innovative program provided rebates directly to compact fluorescent light bulb manufacturers, thereby dramatically reducing the price of the bulbs to consumers, while requiring the light bulbs to meet increasingly stringent performance standards. The CPUC's staff evaluation of the 2006-2008 Upstream Lighting Program (ULP Evaluation Report) concluded that the Upstream Lighting Program was a success in that it provided over \$50 million in net benefits to utility customers.

However, California's recent program to promote energy-efficient light bulbs was a far bigger success than the CPUC's staff evaluation indicates. As detailed in this report, errors and biases in estimates for incremental measure costs, net-to-gross ratio (NTGR), and installations in the ULP Evaluation Report resulted in an erroneously large estimate of program costs and an extremely low estimate of program benefits. ***When corrections for these three areas are made, net benefits increase by over \$1 billion. In total, the program provided customers with over \$7 in benefits in energy savings and pollution reductions for every \$1 invested.***

The intent of this report is first and foremost to develop a more accurate and representative estimate of the impacts of the Upstream Lighting Program. Some stakeholders have questioned whether the efficiency programs in California have been successful or whether the state would have achieved the savings even without the programs, based largely on perceptions about the ULP. This analysis highlights that the efficiency programs have been an enormous success for California consumers, and that these savings would *not* have been achieved without the program. It also highlights the need for the CPUC to provide a process to resolve the legitimate technical disputes that experts may have over evaluation results, so that the CPUC can be sure it understands the full impact of the efficiency programs it oversees.

NRDC does not believe that the 2006-08 ULP program should be revived unchanged, nor that the CPUC should re-litigate the utilities' incentives for efficiency during those years. Instead, we believe that lighting programs should continue to evolve over time, as they have done for decades. The purpose of the revised estimates in this report is to provide a truer picture of past program impacts and thereby a better guide to help California take full advantage of future opportunities to achieve cost-effective energy efficiency savings.

## **I. Introduction**

Early in the past decade, the state's three largest private electric utilities working with their regulators developed a strategy to transform California's market for light bulbs. The utilities provided rebates directly to compact fluorescent light bulb manufacturers to dramatically reduce the price of the bulbs to consumers while requiring them to meet increasingly stringent performance standards. This initiative, known as the Upstream Lighting Program (ULP), accounted for 56% of the net expected energy savings from the portfolio of programs administered by these utilities over the 3-year program period from 2006 to 2008.

Based on the California utilities' approved program plans, the program was wildly successful. The California utilities provided upstream rebates on over 90 million efficient light bulbs from 2006 to 2008, with 43 million sold in 2008 alone. In terms of the number of bulbs rebated, the utilities achieved 150% of the stretch goals established by the Commission. Annual statewide sales of CFLs increased ten-fold from 2003 to 2008<sup>1</sup>.

In February 2010, the Energy Division of the California Public Utilities Commission (CPUC) released its evaluation (ULP Evaluation Report) of the impacts of the 2006-2008 ULP program<sup>2</sup>. The goal of the ULP Evaluation Report was to estimate how much electricity was saved and how much peak demand was reduced by the CFLs that received rebates through the program. Surprisingly, this report concluded that the net savings from each bulb was only 25% of what was expected when the CPUC approved the programs. As a result, even though the utilities substantially exceeded their goals, the ULP evaluation proposed to credit the utilities with achieving only a small fraction of the expected energy savings for the ULP. Since the ULP was such a large fraction of the overall portfolio, this made it nearly impossible for the utilities to meet their savings goals for the overall portfolio.

It is important to note that the ULP program was found to be cost-effective even under dramatically reduced estimates of savings in the Evaluation Report. The Energy Division found this program to be clearly cost effective, saving utility customers tens of millions of dollars.

### **Overview of Reanalysis**

This paper offers a reanalysis of just three of the parameters that led to the dramatic reduction in energy savings in the ULP Evaluation Report. Each of the three is described briefly below. A detailed explanation of the three parameters and the impact on energy savings is followed by a summary of the results of the reanalysis.

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<sup>1</sup> The year 2003 is a reasonable starting point both because it immediately preceded the significant expansion of the ULP program to its current status and because it could reasonably be considered the most up-to-date sales data available when the utilities developed and the CPUC reviewed the 2006-08 program plans.

<sup>2</sup> "Final Evaluation Report: Upstream Lighting Program," KEMA, Inc., February 8, 2010  
[http://www.energydataweb.com/cpucFiles/18/FinalUpstreamLightingEvaluationReport\\_2.pdf](http://www.energydataweb.com/cpucFiles/18/FinalUpstreamLightingEvaluationReport_2.pdf)

- **Incremental measure cost:** According to CPUC policy rules, total program costs from a societal perspective include the net incremental cost to program participants of the efficiency measures that are promoted through the program (i.e. CFLs). In estimating program costs, the ULP Evaluation Report failed to account for the cost savings from the incandescent lamps that participants avoided purchasing. We provide a revised estimate of program costs that accounts for the cost savings from avoided incandescents.
- **Net-to-gross ratio:** According to CPUC policy rules, the calculation of program benefits only includes energy savings from CFL sales beyond what would have occurred in the absence of the program. The ULP Evaluation Report estimated that nearly half of the CFL sales would have occurred in the absence of the program. Based on a corrected analysis of report data and a review of national sales trends, we propose a revised NTGR.
- **Post-2008 installations:** CPUC policy rules credit utilities with savings from measures installed during the program cycle. The ULP evaluation interpreted this rule to include costs but exclude savings from bulbs rebated through the ULP but installed after December 31, 2008. In order to provide an estimate of the full benefits of the ULP, we recalculate total benefits to include savings from bulbs installed in 2009 and 2010.

To determine the impact of these three factors, the Natural Resources Defense Council (NRDC) contracted with the Heschong Mahone Group (HMG) to calculate total costs, total benefits<sup>3</sup>, net benefits, and the benefit-to-cost ratio for the 2006-08 ULP after adjusting for each of the three revised parameter estimates separately and in combination. The results of the reanalysis are described in section V of this report and summarized below in Table 1 and Figure 1. A memo from HMG describing their analysis is included as Attachment A.

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<sup>3</sup> Program benefits represent the cost savings from meeting electricity demand through efficiency rather than increased generation.

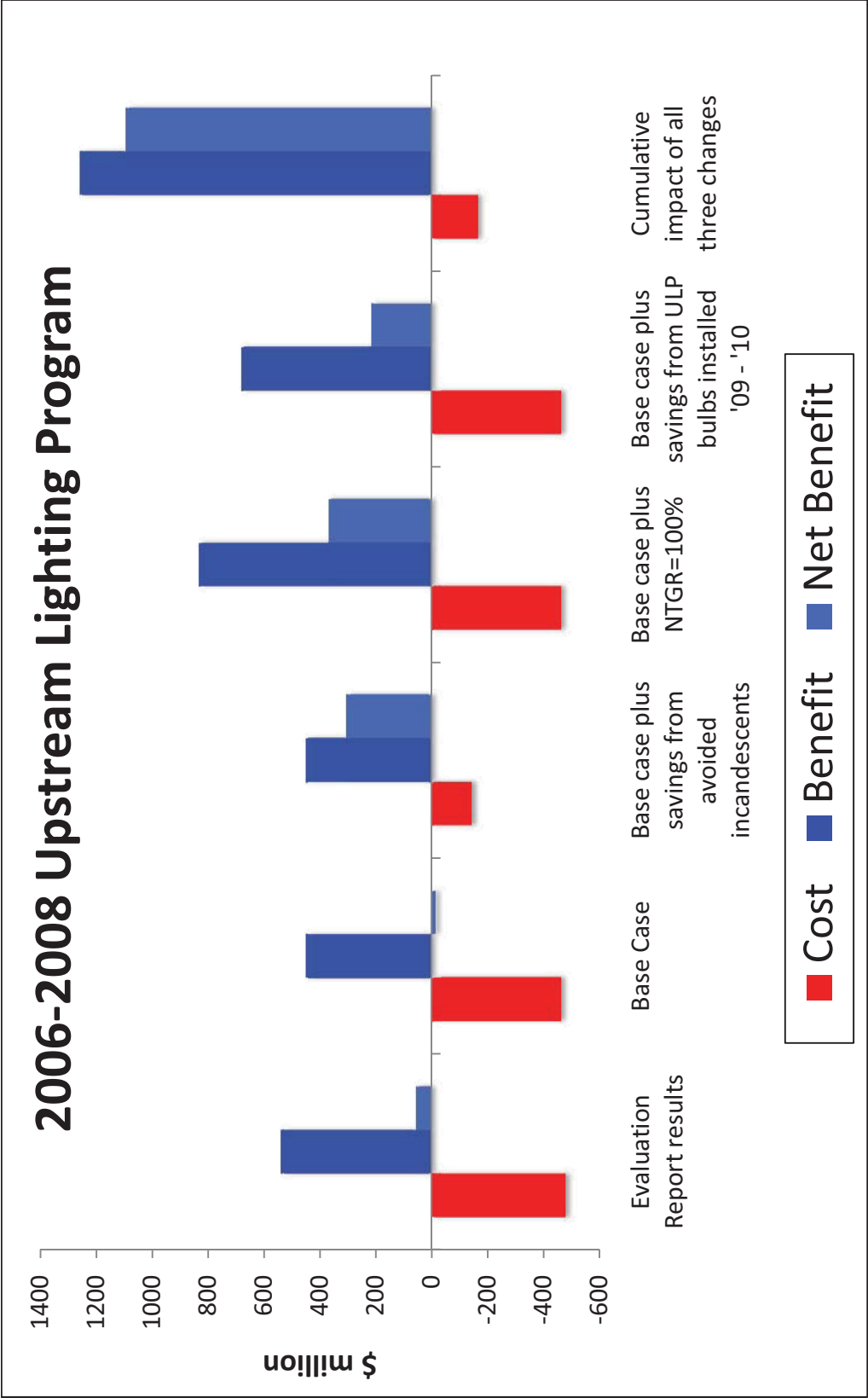
**Table 1: Costs and benefits of 2006-08 ULP using different parameter estimates**

	Cost	Benefit	Net Benefits	Benefit/Cost ratio
	(Million \$)			
Evaluation Report results (1)	-\$481	\$537	\$56	1.1
Base Case (2)	-\$465	\$449	\$-16	1.0
Base case + Cost savings from avoided bulbs	-\$146	\$449	\$303	3.1
Base case + Net-to-Gross Ratio = 100%	-\$465	\$831	\$367	1.8
Base case + Savings from bulbs installed '09 - '10	-\$465	\$680	\$215	1.5
Base case + Cost savings from avoided bulbs Net-to-Gross Ratio = 100% Savings from bulbs installed '09 - '10	-\$167	\$1,258	\$1,092	7.6

(1) Base on reported results for the Upstream Lighting Program (i.e. PGE2000, SCE 2501, SDGE3016) in the 2006-08 Energy Efficiency Evaluation Report.

(2) The Base Case is based on Evaluation Report models and estimates of measure cost, NTGR, and installation rate. The Base Case is labeled "Scenario A1, NTGR = 54% in the HMG analysis.

Figure 1: Costs and benefits of 2006-08 ULP using different parameter estimates



We attempted to reproduce the results reported by Energy Division staff in the Summary Report on 2006-08 impacts<sup>4</sup> in order to provide a clear basis for comparison to the ULP Evaluation Report. We contacted Energy Division in an effort to properly align our base case with their final evaluation numbers, but were unable to exactly reproduce their results. Our “Base Case” scenario uses the same models and adopts the same values for incremental measure cost, NTGR, and installation rate<sup>5</sup>. However, the benefits we calculate using their parameter values are approximately \$70 million lower than reported by Energy Division. The Benefit-to-Cost ratio for our Base Case is 1.0 compared to the 1.1 reported by Energy Division<sup>6</sup>.

The lifecycle benefits estimated by Energy Division are approximately 20% greater than for our Base Case scenario. Adjusting our analysis to account for the difference would likely result in a proportional increase in total benefits for the other scenarios. In other words, if we were able to precisely replicate the Energy Division results, the total benefits for each of the scenarios would likely increase by approximately 20%.

This reanalysis only includes a revised estimate of ULP impacts based on updates to these three specific parameters. However, the staff Evaluation Report also revised a number of other parameters that further reduced the estimated net benefits of the ULP. Other parameter changes from the original CPUC-approved program plans that also resulted in reduced net benefits were lower hours of use, much greater interactive effects, fewer non-residential installations, and the exclusion of installations outside IOU service territories. Reanalysis of these additional parameters could result in substantial additional increases to the estimated benefits of the ULP.

## **II. Incremental Measure Cost**

The ULP was so successful at stimulating purchases of CFLs in large part because it was able to lower the price of a CFL to less than the cost of the incandescent bulbs that it would replace. As described in the Evaluation Report, the ULP provided rebates directly to lighting manufacturers. The rebate resulted in a lower price to retailers who imposed a lower markup on the wholesale price. A rebate that averaged less than \$1.60 per bulb resulted in a net price reduction at the register for consumers that totaled \$2.70 per bulb. Overall, the net impact of the program was to reduce the retail price of CFLs from \$4.00 to \$1.30<sup>7</sup>.

By reducing the price of a CFL by two-thirds, the ULP addressed a key market barrier to CFL adoption: higher first cost<sup>8</sup>. Customers that would have otherwise been put off by the higher first cost of CFLs, were much more likely to replace their incandescent bulbs.

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<sup>4</sup> “[2006-2008 Energy Efficiency Evaluation Report](#),” Energy Division, CPUC, July 2010

<sup>5</sup> This scenario is labeled “A1, NTGR=54%” in the HMG analysis.

<sup>6</sup> Based on the following programs: PGE 2000, SCE 2501, and SDGE 3016.

<sup>7</sup> To summarize: the average price of a non-rebated bulb was \$4.00; the average price of a rebated bulb was \$1.30; savings at the register was \$2.70 (= \$4.00 minus \$1.30).

<sup>8</sup> The ULP also addressed other market barriers to CFL adoption including product quality, availability, and awareness.



Moreover, by rebating manufacturers directly, rebate dollars were leveraged; every dollar rebated to a manufacturer lowered the cost of a CFL sold in California by \$1.70<sup>9</sup>.

As a result of the price reduction, the program was able to lower the net cost of a CFL to below the cost of the incandescent bulbs a customer would otherwise have to purchase. The staff Evaluation Report cites a CFL lifetime equal to 6.6 incandescents at a cost of 65 cents apiece<sup>10</sup>. The discounted, cumulative cost of those incandescents totals \$3.48<sup>11</sup>, over 2.5 times higher than the retail price of the CFL. In other words, energy savings aside, customers saved money just by purchasing rebated CFLs instead of incandescents.

Customers that would have bought a CFL anyway (i.e. free riders) were able to benefit immediately as well. Rather than purchase the bulb for \$4.00, these customers were able to buy a CFL for only \$1.30. Of course, \$1.57 of the reduced cost of each bulb came from the upstream rebate, which showed up as an increased cost on their utility bill. But the leverage that came from providing the rebate directly to the manufacturer resulted in an additional discount of \$1.13 per bulb.

In accounting for the benefits and costs of energy efficiency programs from a societal perspective, total costs are defined to include the program administrative cost plus the incremental cost of the efficiency measures relative to the less efficient technologies that they replace. However, rather than use the incremental cost of the CFLs, the Energy Division cost-effectiveness analysis simply included the much higher total cost of the CFL rebated through the program.

This error results in a substantial overestimate of total program costs. As described above, the incremental measure cost of CFLs rebated through the 2006-08 ULP was substantially negative. Based entirely on cost data provided in the ULP evaluation, the sale of CFLs through the ULP provided total incremental measure cost savings of \$207 million to CFL purchasers<sup>12</sup>.

The difference between the staff calculation and one that accurately accounts for incremental measure costs is \$319 million<sup>13</sup>. As shown in Figure 1 and Table 1, accurately accounting for incremental measure costs lowers the total cost of the program by nearly two-thirds from \$465 million to \$146 million<sup>14</sup>. The lower total cost also

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<sup>9</sup> The average rebate was \$1.57. The price reduction per dollar of rebate was \$1.70 (= \$2.70 divided by \$1.57).

<sup>10</sup> "Final Evaluation Report: Upstream Lighting Program," pg. 181

<sup>11</sup> Discounted to present value at 8%.

<sup>12</sup> The calculation of net incremental measure cost is different for net participants and free riders. Therefore total incremental cost varies depending on the NTGR. In either case, incremental measure costs are negative, i.e. there are net measure savings. Total incremental cost savings are \$207 million at a 54% NTGR and \$187 million at a 100% NTGR. Incidentally, if all participants were free riders the program would provide no energy savings but \$97 million in savings on lower cost bulbs.

<sup>13</sup> The difference between costs of \$111 million and savings of \$207 million.

<sup>14</sup> The incremental measure cost calculation differs for net participants – who avoid the purchase of a stream of incandescents – and free riders – who avoid the purchase of a more expensive CFL. This figure cited here is based on the 54% NTGR proposed in the ULP Evaluation Report.

results in increased net economic benefits from the program (and from the overall portfolio) by a commensurate \$319 million<sup>15</sup>.

### **III. Net-to-Gross Ratio**

Perhaps the biggest issue arising from the ULP Evaluation Report is the estimate of the fraction of program savings that would have occurred if the program had not been implemented. This estimate is known as the net-to-gross ratio (NTGR). This parameter is difficult to estimate with confidence in any case. In this instance, the estimation of NTGR was particularly challenging.

Estimation of NTGR usually requires an assessment of the market conditions prior to program implementation. However, the ULP evaluation didn't begin to collect market data from participants until 2008, following two years of a massive market intervention. By that time, it had become extremely difficult to collect unbiased data on market conditions in the absence of the program with any confidence.

The NTGR estimation was further complicated by the use of complex modeling approaches whose practical effectiveness had not been tested and a significantly delayed start to the evaluation. The report authors candidly acknowledge concern that "none of the NTGR results derived from the various methods can be considered representative of the 2006-08 program<sup>16</sup>." Ultimately, the authors chose to reject the only NTGR estimates that were defined as representative of the full 2006-2008 program and instead to simply recommend a NTGR estimate of 54% based on the consultant's "best judgment<sup>17</sup>."

In other words, the evaluators estimated that the utility program was only "responsible" for just over half of the savings that were achieved. This NTGR represents a reduction in total net benefits of one third relative to the 80% NTGR assumed in the program applications approved by the CPUC. As described below, a careful evaluation of available evidence shows that a substantially higher estimate of NTGR is justified based on ULP Evaluation Report data and national sales trends.

#### **Evaluation Report Analysis Actually Supports Much Higher NTGR**

One of the ways the ULP evaluation tried to estimate how many bulbs would have been sold in the absence of the program was to ask survey respondents how many bulbs they would have bought at twice the price that they actually paid. Based on their responses, the evaluation developed an estimate of how many bulbs would have been purchased without the price discount from the program. This method of estimating NTGR is called the "stated preference" approach, because it's based on the stated preferences of a sample of purchasers.

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<sup>15</sup> = \$465 million minus \$146 million.

<sup>16</sup> "Final Evaluation Report: Upstream Lighting Program," pg. 82

<sup>17</sup> "Final Evaluation Report: Upstream Lighting Program," pg. 82

This approach to estimating NTGR has been used often in the past, though it has a number of problems that limit its value. For example, survey respondents often do not evaluate their willingness to buy at different hypothetical price points in a purely objective way. People who are approached while walking out of a store may tend to understate their sensitivity to price in order to justify the purchase which they just made. This bias will result in an estimate of purchases in the absence of the program that is skewed to the high side.

Another problem with this approach is that it fails to account for changes in the market due to the program other than price – such as availability and product quality – that affect whether consumers will purchase CFLs. For the ULP, the changes in the CFL market as a result of the program were significant. The ULP was an extremely ambitious program that increased the availability and retail visibility of high-quality bulbs. This survey was not conducted until well into the third year of this three-year effort. By the third year, consumers had much greater familiarity and accessibility to a wide range of high-quality bulbs as well as multiple exposures to information on the cost-savings. All of these factors increased consumers' propensity to purchase bulbs.

By asking only about the price difference, the stated preference survey used for this report fails to credit the program with all of the non-price program-induced changes in CFL markets that made CFLs more appealing to purchasers. Instead, all of those key market changes implicitly count against the program. In order to get a more accurate perspective on the overall impact of the program, the question the survey should have asked purchasers is how many bulbs they would have bought if the bulbs cost twice as much, were of lower quality and harder to find and they didn't know the bulbs cut electricity use and saved lots of money. Clearly their answer would be a lot less than if the only difference was price.

The stated preference analysis imposes yet another downward bias to the NTGR. In response to the question of how many bulbs they would have bought at twice the price, purchasers could select from the responses: "same," "none," or "fewer." While the first two responses are unambiguous, "fewer" requires some interpretation. If "fewer" is assumed to mean "a lot fewer," then the results will be biased towards portraying purchasers as more sensitive to price. If it is assumed to mean "a little fewer," then the results will suggest a relatively lower sensitivity to price.

For the ULP evaluation, the report chose to assume that "fewer" means they would still buy four out of five bulbs if they were twice the price. Absolutely no evidence is used to support the downward bias imposed by this assumption, which results in a NTGR that is about 15% lower than the obvious alternative assumption that fewer means half as many.

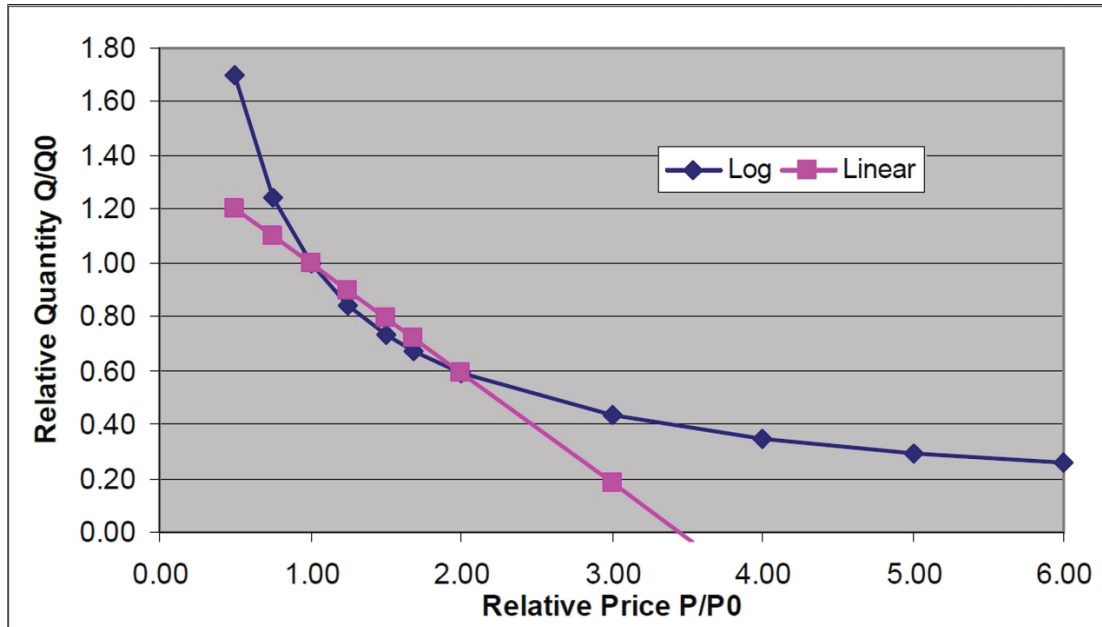
In sum, as employed in this report the stated preference approach ignores the widespread market effects from the program and instead assumes that the only impact of the program is on price. And then, the survey results are interpreted in a way that portrays purchasers as relatively price insensitive. The resulting model of purchaser preferences is clearly biased to underestimate the impact of the program.

Even with all of these inherent biases, the most egregious problem with this analysis is that the authors failed to use the actual reduction in price achieved by the program. The analysis simply provides results based on the hypothetical doubling of price that was used in the survey, as if that were representative of the program's actual impact on prices.

Fortunately, the Evaluation Report provides estimates of the actual impact of the program on prices. As described above, the average program bulb cost \$1.30 compared to an average non-program bulb at \$4.00. Without the program (and ignoring the non-price benefits), bulbs wouldn't have cost twice as much. They would have cost three times as much.

The stated preference model used in the ULP Evaluation Report allows for the calculation of an estimated NTGR taking into account the actual price savings. Figure 2 below portrays the stated preference model developed for the Evaluation Report (Figure 5 in the ULP Evaluation Report)<sup>18</sup>. Two different plausible models of purchaser preference are included, a linear model and a logarithmic model. Based on the assumptions described above, the authors use these models to conclude that at twice the price (i.e. relative price = 2.0), sales would have been 60% of what they were at the program price (i.e. relative quantity = 0.6). This corresponds to a NTGR of 40%, representing the sales that the program was responsible for.

Figure 2: Stated Preference Model



But, as noted above, the average non-program bulb cost three times as much as an average program bulb, corresponding to a relative price of 3.0. Based on the stated preference models, the relative quantity is somewhere between 0.2 and 0.4 at a relative

<sup>18</sup> "Final Evaluation Report: Upstream Lighting Program," pg. 196

price of 3.0. If we pick the midpoint of this range, we conclude that sales without the program would have been only 30% of what they were with the program. That would mean the program is responsible for 70% of the sales or, in other words, that the NTGR is 70%.

As described above, the revealed preference model results are biased to underestimating the NTGR. Therefore, the estimate of a 70% NTGR based on the stated preference models should be seen as substantially lower than the actual value. For instance, simply adopting the interpretation that "fewer" means "half as many" would increase the estimated NTGR from 70% to approximately 80%. Therefore, a straightforward, unbiased review of the stated preference model developed for the ULP Evaluation Report supports a NTGR of at least 80%. Moreover, after accounting for the other downward biases in the analysis, it is clearly consistent with a substantially higher value.

### **Actual Growth in CFL Sales Far Exceeds Historical Trends**

An evaluation of national sales trends also supports a higher NTGR. In 2002, total sales of CFLs in California were around 4.5 million per year. Utility incentive programs are estimated to have been responsible for sales of approximately 2.8 million of these lamps. The remaining 1.7 million was due to consumer demand from early adopters and represents the best estimate of what sales would have been in 2002 without the utility incentive program. Total statewide sales dropped somewhat from 2001 to 2002, but there was a modest uptick in sales of approximately 170,000 in 2003. If we assume this growth was not due to program effects, then the rate of sales growth outside the program from 2002 to 2003 was about 10% per year<sup>19</sup>.

As the utilities prepared to implement the new upstream CFL rebate program, the question facing the utilities and the CPUC was what would happen to sales over the next five years in the absence of a CFL rebate program in the state. The year 2003 is a reasonable starting point both because it immediately preceded the significant expansion of the ULP program to its current status and because it could reasonably be considered the most up-to-date sales data available when the utilities developed and the CPUC reviewed the 2006-08 program plans. Obviously, one plausible forecast is that the 2002 to 2003 growth rate of 10% would be sustained. A growth rate of 10% beginning in 2003 would have resulted in sales of 3 million CFLs in 2008<sup>20</sup>.

There is no way to know what would have happened if the California utilities hadn't run the ULP, but we do know what actually did happen. In 2008, CFL sales in California totaled 52.1 million lamps with rebates provided to customers for 42.6 million of those lamps<sup>21</sup>. If we adopt the estimate that CFL sales would have continued to grow at 10%

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<sup>19</sup> Sales data is from: "California Lamp Report 2003." Itron, July 15, 2004. This calculation assumes a NTGR of 80% for 2002 and 2003. A lower NTGR would result in more sales in the absence of the program, but a lower growth rate. For example, a 60% NTGR would increase the estimate of 2003 sales without the program by 40% but decrease the annual growth rate to 7%.

<sup>20</sup> Assuming a starting point of 1.7 million lamps, sales growth of 10%/year for 5 years results in 2008 sales of 3 million lamps. Similarly, a 37%/year growth rate for 5 years results in 2008 sales of 8.8 million lamps.

<sup>21</sup> "Final Evaluation Report: Upstream Lighting Program."

per year without the program, then a total of 49.1 million lamps were sold as a result of the program (52.1 million minus 3 million). Since rebates were provided for only 42.6 million lamps, the estimated NTGR should be 115% (49.1 million divided by 42.6 million), more than double the 54% rate based on the consultant's "best judgment."<sup>22</sup>

Of course, one might argue that CFLs were actually poised in California in 2003 for even faster sales growth. For example, if sales in other parts of the country grew even faster than 10 percent, that would be an indication that this forecast sales growth rate was too low. In fact, it turns out that the average rate of growth in CFL sales from 2003 to 2008 in the rest of the U.S. was 37% per year<sup>23</sup>. Of course, efficiency programs in other states were also providing incentives to consumers that led to increased sales<sup>24</sup>. In addition, the California programs were run in part through national retailers and likely resulted in additional, unrebated sales outside California, at least in neighboring states. However, for the sake of argument, let's assume that the California ULP and programs in other states had absolutely no effect on sales in other states and that, in the absence of the ULP, California would have enjoyed the same rapid growth in CFL sales of 37% per year. Under this hypothetical scenario, California CFL sales in 2008 would have totaled 8.8 million lamps. That estimate, when compared to actual sales in 2008, results in a NTGR of 102%<sup>25</sup>.

In other words, even if one assumes that the rapid growth in CFL sales in the rest of the US from 2003-08 was not due in any way to the energy efficiency programs implemented over that period and one also assumes that California would have experienced similarly rapid sales growth, then the net benefits of the program are still roughly twice as large as the ULP evaluation concludes.

Let's look at this in a different way. How large would the growth rate in sales have to have been in California without the efficiency programs to justify the estimated NTGR of 54%? In order to justify a NTGR this low, CFL sales would have had to grow from under 1.7 million in 2003 to 29.3 million lamps in 2008 without utility incentives. As shown in Figure 3, the growth rate required to get to this level of sales is 74% per year. In other words, the growth rate in CFL sales in California without a program would have to have been twice as large as the growth rate that actually occurred in the rest of the U.S., during a period in which there were ambitious, well-funded programs in a number of states. As noted earlier, the ULP evaluation provides neither conclusive evidence nor analysis to support this highly implausible result.

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<sup>22</sup> A NTGR of over 100% means that the program resulted in sales of some lamps in addition to those that got rebates. This could happen because of increased customer awareness and acceptance among other factors. A number of states, including New York, Vermont, and Massachusetts currently credit their CFL rebate programs with NTGRs of greater than 100%.

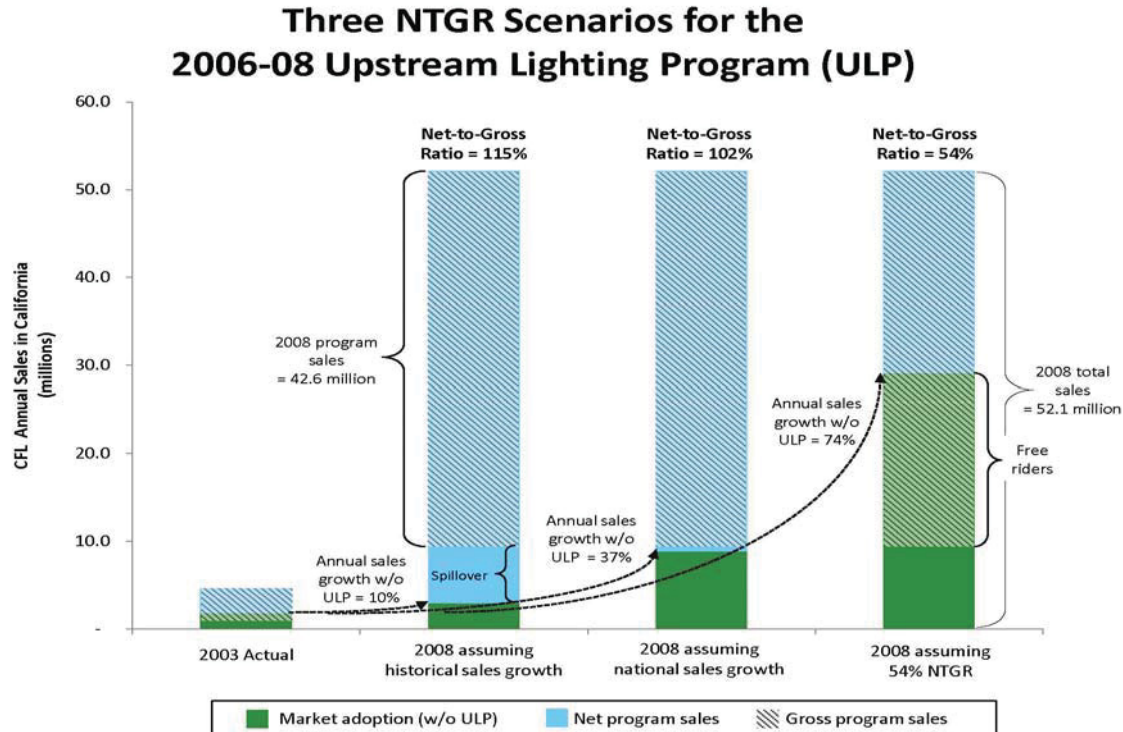
<sup>23</sup> Ecos Consulting analysis of USA Trade Online data

<sup>24</sup> "CFL Market Profile." U.S. DOE. March 2009

<sup>25</sup> Assuming a starting point of 1.7 million lamps, sales growth of 10%/year for 5 years results in 2008 sales of 3 million lamps. Similarly, a 37%/year growth rate for 5 years results in 2008 sales of 8.8 million.



Figure 3: National sales analysis 2003-2008



### 2009 Sales Data Confirms Big Impact of Program on Sales

In 2009, the CPUC directed the utilities to dramatically scale back the ULP effort. In effect, the CPUC implemented a natural experiment that allows us to test whether CFL sales would be sustained and continue to grow in the absence of the program. Recently, the Energy Division staff posted their estimate of bulbs sales in 2009<sup>26</sup>, allowing us to evaluate whether that experiment provides confirmation of the conclusions in the Evaluation Report.

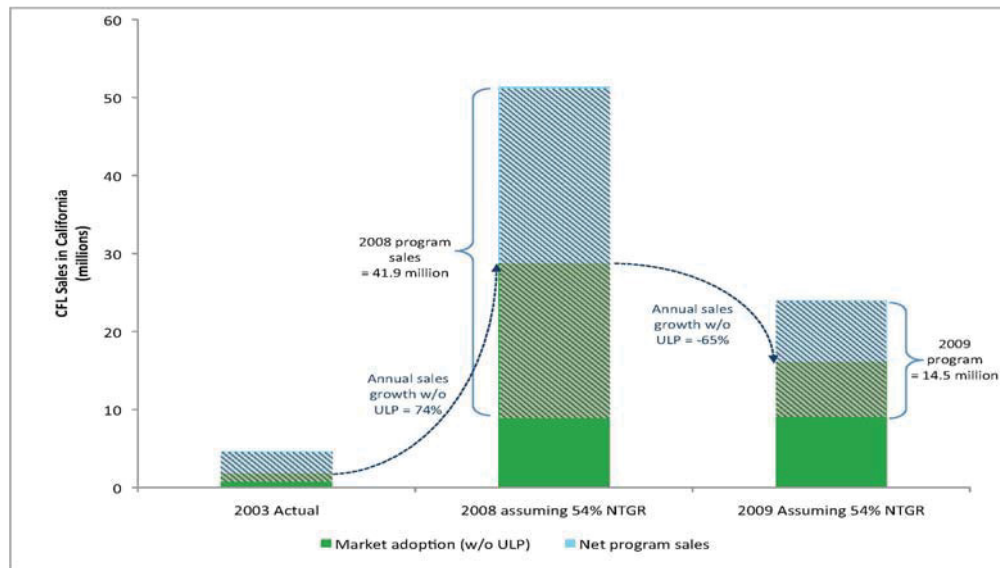
What are the results? According to the Energy Division memo, statewide sales of CFLs in 2009 totaled only 24 million, a reduction of more than 50% from 2008. Sales in 2009 were even 18% lower than the Evaluation Report estimate of what sales would have been without the program in 2008.

As shown in Figure 4 below, the Evaluation Report analysis implicitly assumes that if the utilities had not implemented the ULP, CFL sales in California would have grown by an average of 74% per year from 2003 to 2008 and then plummeted in 2009 by 44%, rather than continuing to grow.

<sup>26</sup> [Energy Efficiency Evaluation Report for the 2009 Bridge Funding Period: Appendix R](#) Energy Division, CPUC, January 2011

This implausible result is dependent on the assumption that the close tracking of sales and program activity is merely coincidental. But as Figure 4 shows, the rapid growth in sales from 2003 to 2008 and the dramatic decline in 2009 exactly parallels program activity. A much more plausible conclusion is that the program was responsible for the dramatic increase in sales between 2003 and 2008 and the steep decline in sales in 2009 was due to the two-thirds cutback in the ULP<sup>27</sup>.

Figure 4: 2009 Sales Analysis



This finding shouldn't really come as a surprise. After all, this program was designed to transform the market by achieving a large increase in the sales of low-cost, high-quality bulbs. To a neutral observer, the 2009 sales data provide strong support for the conclusion that program was in fact responsible for nearly all of the increase in sales.

One possible counter to this conclusion is that the decrease of sales in 2009 was due to the recession rather than the program cutbacks. This does not appear to be the case since the recession resulted in reduced CFL sales in the rest of the U.S. in 2008, but not in California. Total CFL sales in the rest of the U.S. dropped by 28% in 2008. In California, where CFLs were available at very low cost because of the ULP, CFL sales grew by approximately 10% in the same year. California sales didn't drop until 2009, when program spending was slashed.

The drop in sales in 2009 lends further support for the conclusion that the upstream lighting program was responsible for the vast majority of the increase in sales from 2006 to 2008. In contrast the 54% NTGR from the Evaluation Report is flatly inconsistent with the 2009 sales data.

<sup>27</sup> The number of IOU discounted bulbs sold in 2008 and 2009 was 41.9 and 14.5, respectively.



## **Actual Benefits of Lighting Efficiency Program are Likely Twice as Large as Estimated**

To summarize, the estimated NTGR of 54% from the ULP Evaluation Report is based on an implicit assertion that in 2003 sales were somehow poised to grow at the extraordinarily rapid rate of 74% per year for five years running and then plummet by 44%, despite modest at best sales growth from 2001 to 2003. But even if one assumes that sales would have risen at 37% per year based on sales growth in other states, the NTGR in 2008 should be 102%, nearly twice the “best judgment” estimate from the ULP Evaluation Report. The bottom line is that the proposed NTGR of 54%, which is based solely on a consultant's judgment, is unsupported by readily available evidence. National sales data from 2003 to 2008 and the decline in sales in California in 2009 demonstrate that this NTGR estimate is far too low and the ULP was likely responsible for savings at least twice as large as the estimated in the Evaluation Report. This conclusion is supported by the stated preference analysis in the ULP Evaluation Report itself.

### **Impact of NTGR Reanalysis**

Since bulbs that were not installed as a result of the program don't contribute energy savings to the calculation of benefits, crediting the program with a higher share of the increase in sales significantly affects the estimated benefits from the program. Based on the foregoing analysis, we recalculated total benefits using a net-to-gross ratio of 100%. Since total benefits increase while costs are unchanged, net benefits also increase substantially.

As shown in Table 1 and Figure 1 below, based on a NTGR of 54% the estimated total benefits in the Base Case are \$449 million. However, using the more plausible estimate of a 100% NTGR, total program benefits increase to over \$800 million<sup>28</sup>.

### **IV. Post-2008 installations**

The CPUC's efficiency program accounting rules include a recently-adopted provision that requires savings to be accounted for in the year in which an efficiency measure is installed, even if the measure was installed as a result of a prior year's program. This provision resulted in a significant change to the Evaluation Report estimate of the benefits of the ULP because, according to the analysis, many of the bulbs that were brought to market as a result of the 2006-08 ULP program were not installed in light fixtures until 2009 or 2010<sup>29</sup>. This accounting convention lowered the estimated net benefits in the ULP Evaluation Report because the benefits are accounted for in later program cycles even though the costs are attributed to the 2006-08 program. Because the

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<sup>28</sup> These figures only account for the revised NTGR and not for the corrected incremental measure costs or the delayed installations.

<sup>29</sup> The estimate of CFL installations in the ULP Evaluation Report was based on an ad hoc model developed after the proposed analysis failed to produce meaningful results. The significant uncertainty associated with the installation rate evaluation provides further support for the value of the “full-benefit accounting” approach.

convention was adopted recently, savings from previous program cycles were not attributed to the 2006-08 program.

This accounting convention was adopted primarily to address programs where benefits may be delayed and will occur for years after program costs are incurred, such as support for building codes and appliance standards. Including all the costs and benefits together in one balance sheet provides a broader perspective that better reflects the overall benefits of the program. In contrast, the approach adopted in the ULP evaluation complies with CPUC accounting rules, but fails to provide an accurate impression of the ULP total benefits. Because a relatively large fraction of program bulbs were not sold and/or installed until after 2008, this more holistic accounting perspective results in a substantial change to the estimate of total program benefits.

According to ULP Evaluation Report estimates, one third of all bulbs rebated through the 2006-08 ULP were not installed and in use by the end of 2008<sup>30</sup>. However, except for a very small number of bulbs which are in ‘permanent storage,’ all of the 2006-08 ULP bulbs were installed and in use by the end of 2010<sup>31</sup>. In other words, the ULP Evaluation Report includes the costs, but not the benefits, of 28.6 million bulbs that were purchased and installed by utility customers. As shown in Table 1 and Figure 1 including the benefits of these bulbs results in an increase in total benefits of approximately 50%, from \$449 million to \$680 million<sup>32</sup>.

## **V. Results**

As described in this memo, the ULP Evaluation Study adopted estimates for incremental measure costs, NTGR, and installations that resulted in an erroneously large estimate of program costs and an extremely low estimate of program benefits. Even with these biased estimates, the ULP Evaluation Report concluded that the program provided over \$50 million in net benefits to utility customers.

A corrected estimate of incremental measure costs, a full accounting of delayed installations, and an unbiased estimate of NTGR each result in an increase to estimated net benefits of hundreds of millions of dollars. Adjusting both the NTGR and accounting for delayed installations results in a greater increase in benefits than a simple sum of the two changes in isolation. In combination, these three changes result in nearly a tripling of total benefits. As shown in Figure 1 and Table 1, total benefits increase from \$449 million under the Base Case scenario to over \$1.2 billion when all three changes are adopted.

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<sup>30</sup> The ULP evaluation ran into problems in the attempt to estimate the installation rate of CFLs through the program. The evaluation plan proposed to estimate a set of three inter-related models from a survey of users. Unfortunately, as the authors explain, the models did not produce meaningful results and an ad hoc alternative had to be developed late in the study process.

<sup>31</sup> ULP Evaluation Report, p. 124

<sup>32</sup> These figures only account for the benefits of delayed installations and not for the corrected incremental measure costs or the revised NTGR.

As noted earlier, under current CPUC policy program benefits are counted in the program cycle in which measures are installed<sup>33</sup>. Therefore, if one were to re-estimate 2006-08 portfolio net benefits, only the first two of the parameters evaluated in this report would be used. Changing only the estimate of measure costs and NTGR results in an increase in total benefits of \$701 million, relative to the Base Case scenario.

As noted earlier, we attempted to reproduce the results reported by Energy Division staff in the Summary Report on 2006-08 impacts<sup>34</sup>. We were unable to do so. Our “Base Case” scenario adopts the same values recommended in the ULP Evaluation Report for incremental measure cost, NTGR, and total bulbs<sup>35</sup>. However, the net benefits we calculate using these parameter values are approximately \$70 million smaller than reported by Energy Division. Similarly, the Benefit-to-Cost ratio for our Base Case is 1.0 compared to the 1.1 ratio reported by Energy Division.

The intent of this report is first and foremost to develop a more accurate and representative estimate of the impacts of the Upstream Lighting Program. Some stakeholders have questioned whether the efficiency programs in California have been successful or whether the state would have achieved the savings even without the programs, based largely on perceptions about the ULP. This analysis highlights that the efficiency programs have been an enormous success for California consumers, and that these savings would *not* have been achieved without the program. It also highlights the need for the CPUC to provide a process to resolve the legitimate technical disputes that experts may have over evaluation results, so that the CPUC can be sure it understands the full impact of the efficiency programs it oversees.

NRDC does not believe that the 2006-08 ULP program should be revived unchanged, nor that the CPUC should re-litigate the utilities’ incentives for efficiency during those years. Instead, we believe that lighting programs should continue to evolve over time, as they have done for decades. The purpose of the revised estimates in this report is to provide a truer picture of past program impacts and thereby a better guide to help California take full advantage of future opportunities to achieve cost-effective energy efficiency savings.

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<sup>33</sup> Under current CPUC policy, CFLs installed after December 31, 2008 should be excluded from the calculation of net benefits.

<sup>34</sup> “[2006-2008 Energy Efficiency Evaluation Report](#),” Energy Division, CPUC, July 2010

<sup>35</sup> This scenario is labeled “A1, NTGR=54%” in the HMG analysis.



**HESCHONG  
MAHONE  
GROUP**

# MEMORANDUM

July 13, 2011

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**To:** Peter Miller (NRDC)  
**Cc:** Drew Bennett (NRDC)  
**From:** Marian Goebes, Cynthia Austin, Doug Mahone (HMG)  
**Re:** **06-08 Upstream Lighting Program (ULP) Estimates**

## UPSTREAM LIGHTING PROGRAM REANALYSIS

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### Introduction

The Natural Resources Defense Council (NRDC) contracted with the Heschong Mahone Group (HMG) to re-analyze the evaluation estimates for the 2006-08 Statewide California Residential Upstream Lighting Program (ULP). The study intent was to analyze how different parameter values would impact program results. HMG estimated costs, benefits, net benefits, and benefit-to cost ratio for the 2006-08 ULP program under several different scenarios. The matrix of results shows the range of program results that could be estimated, depending on the approach taken.

The original 06-08 evaluation was done by a large team of experts, including CPUC staff and independent consultants, who gathered primary data, conducted extensive analysis, and used various sources (e.g., California Evaluations Protocol, Energy Efficient Evaluation Policy Manual) to develop an official impact evaluation. Results were published in the Final Evaluation Report: Upstream Lighting Program, prepared for the CPUC by KEMA Inc. and the Cadmus Group, Inc., February 8, 2010 ("the ULP Report")<sup>1</sup>.

The analysis done here was far smaller in scope, and the results presented are in no way intended to be an alternative to the original impact evaluation.

### Methodology

This analysis re-evaluates the economic impacts of the ULP based on alternative values for three evaluation parameters, 1. Incremental measure costs; 2. net-to-gross ratio (NTGR); and 3. the inclusion of benefits of bulbs installed in 2009 and 2010. For each parameter, the analysis uses the parameter value adopted in the evaluation team's analysis and an alternative parameter value provided by NRDC. The analysis includes a set of six scenarios using all combinations of parameter values. The initial scenario adopts the three parameter values used in the evaluation team's analysis, in an attempt to replicate the staff results as closely as possible. As described

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<sup>1</sup>Available: [www.energydataweb.com/cpucFiles/18/FinalUpstreamLightingEvaluationReport\\_2.pdf](http://www.energydataweb.com/cpucFiles/18/FinalUpstreamLightingEvaluationReport_2.pdf)



above, total benefits, total costs, net benefits (benefit minus cost), and benefit-to-cost ratio (equivalent to the Total Resource Cost – TRC) are presented for each scenario.

While the program was intended to serve the residential market, the program provided bulbs in stores and did not impose restrictions on where the bulbs were installed. For analysis, we adopted the same approach as the ULP Report: This analysis is for residential upstream lighting programs, but some of these bulbs were installed in nonresidential areas for PG&E and SCE. This analysis excludes the costs and benefits of nonresidential bulbs for PG&E (which were captured in a nonresidential program, PGE 2080), but includes the costs and benefits of nonresidential bulbs for SCE.<sup>2</sup> No bulbs were assumed to be installed in nonresidential areas for SDG&E.

## Total Costs

### *Incremental Measure Cost*

Total cost equals the utility cost<sup>3</sup> plus the incremental cost to consumers. The CPUC Energy Efficiency Policy Manual (version 4) defines the IMC as, “the additional cost of purchasing and installing a more efficient measure - calculated from the price differential between energy-efficient equipment and standard or baseline measures.”<sup>4</sup> It does not discuss how to calculate the IMC when the efficient measure replaces multiple baseline measures (as is the case with a CFL). There is also confusion over how to count free riders’ incremental costs. The CPUC Energy Efficiency Policy Manual states that the TRC includes “costs participants incur”<sup>5</sup>; it makes no distinction between net participants and free rider participants. The Standard Practice Manual (SPM) states that the TRC include “all equipment costs”, and does not distinguish between free riders and net participants<sup>6</sup>. However, the SPM’s formula for the TRC only includes net participant costs (not total participant costs). Because the free riders’ costs were true costs, they were included here. If a participant is a free rider (i.e., would be purchasing the efficient measure regardless of the program), for this program the incremental cost difference for this participant is negative, thereby lowering the total cost of the program to society.

The estimate of utility costs used for all of the scenarios was taken from the input table in the ERT based on utility E3 submittals. It is similar (~6% lower) from the IOU reports on the EEGA website<sup>7</sup>. The incremental cost to consumers was calculated by multiplying the incremental measure cost per CFL bulb by the number of bulbs purchased by consumers. The number of

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<sup>2</sup> Based on the ULP Report, p. xi, footnote 2, which states that the nonresidential portion was included in another program (PGE2080) for PG&E and included in the residential program for SCE. According to the ULP Report p. 4, no bulbs were assumed to be installed in nonresidential areas for SDG&E.

<sup>3</sup> Utility cost includes rebate costs plus administrative costs.

<sup>4</sup> CPUC, Energy Efficiency Policy Manual, v. 4.0, p.7. 2008

<sup>5</sup> CPUC, Energy Efficiency Policy Manual, v. 4.0, p. 12, 2008

<sup>6</sup> Standard Practice Manual, P. 18

<sup>7</sup> Quarterly and Annual reports from IOUs (PG&E 2008 Annual report; SCE and SDGE 2008 Q4 reports): <http://eeqa2006.cpuc.ca.gov/DisplayQuarterlyReport.aspx?ID=9>.



bulbs purchased by consumers was estimated as 86 million, through the following approach. Because some of the rebated bulbs were lost to leakage or lack of verification, the “Bulbs purchased by consumers” is less than the Total Rebated Bulbs.

*Bulbs purchased by consumers = Total Rebated Bulbs x (100% - Leakage Rate) x (Invoice / Verification)*

The IMC is calculated differently for each approach. The approaches are:

- A. IMC is the full cost of a rebated CFL bulb (\$1.30). In this approach, the cost savings of the avoided bulb purchases is not included. This appears to be the approach used in the original evaluation.
- B. This approach includes the cost savings from the purchases that are avoided by purchasing a rebated bulb. Net participants avoid the purchase of a discounted stream of shorter-lived incandescent lamps, while free riders avoid the purchase of an unrebated CFL. For net participants, the IMC is the cost difference between a rebated CFL and the net present value of the equivalent number of incandescents it replaces. For free riders, IMC is the cost difference between a rebated CFL (\$1.30) and a non-rebated CFL (\$4). The total IMC is calculated as a weighted average of the IMC for net participants and free riders based on the net-to-gross ratio (NTGR). Because the cost of the rebated bulb is lower than the cost of the avoided purchase for both free riders and net participants, the IMC for this scenario is negative.

## Total Benefits

### *Net- to- Gross Ratio*

According to the California Energy Efficiency Evaluation Protocols, the net-to-gross ratio (NTGR) is a ratio or percentage of net program impacts divided by gross or total impacts. Net savings are energy savings attributable to the program’s net participants – those that are not free riders. (Free riders would have installed the energy efficient measure, regardless of whether or not there was a program.) Gross savings are the energy savings from program-related actions taken by all program participants, regardless of why they participated. Some regions / states include spillover in the calculation of NTGR. Spillover refers to savings indirectly attributed to the program: from non-participants, or from program participants taking actions to generate other savings beyond those incented by the program. In the 2010 CFL Market Profile memo<sup>8</sup>, (prepared by D&R International for the USDOE), the authors noted that there is variation across the U.S. both in the official NTGR (ranging from 41-160% for the different states) and in the method used to calculate NTGR. For example, several states show a NTGR > 1, which suggests that program spillover is included. However, the California Public Utility Commission has passed a decision that spillover should not be included in the NTGR<sup>9</sup>.

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<sup>8</sup> Energy Star CFL Market Profile. Prepared for the US DOE by D&R International, September 2010.  
[http://www.drintl.com/Data/Sites/1/downloads/publications/2010\\_cfl\\_market\\_profile.pdf](http://www.drintl.com/Data/Sites/1/downloads/publications/2010_cfl_market_profile.pdf)

<sup>9</sup> CPUC 2007b. California Public Utilities Commission, Interim Opinion On Issues Relating To Future Savings Goals And Program Planning For 2009-2011 Energy Efficiency And Beyond, Decision 07-10-032 October 18, 2007 [http://docs.cpuc.ca.gov/word\\_pdf/FINAL\\_DECISION/74107.pdf](http://docs.cpuc.ca.gov/word_pdf/FINAL_DECISION/74107.pdf)





Under the California policy framework, NTGR is used to describe the free-ridership that may be occurring within energy efficiency programs. For example, a NTGR = 0.8 suggests that 80% of the program's savings are from net participants, and 20% from free riders. A low NTGR indicates a high percentage of free riders.

In this analysis, two NTGR's were applied:

- ◆ NTGR = 54%, which assumes that almost half of participants were free riders. This was the approach taken by the 2006-08 program evaluators
- ◆ NTGR = 100%, which assumes that there were no free riders.

### *Savings from bulbs installed in 2009 and 2010*

Total benefits is the energy savings from an efficient measure, (compared with its equivalent baseline measure), for its effective useful life (EUL) valued at the avoided cost of electricity. Benefits were calculated using the CPUC's calculator (E3 version 4f2, which was used for the 06 - 08 evaluation), which includes built-in assumptions of the value of avoided electricity, and savings per bulb.<sup>10</sup> The benefit calculation also included the interactive effect – the negative gas savings assumed to result from the increase in heating needs, because a CFL releases less waste heat than an incandescent bulb.<sup>11</sup> We used the 06-08 CPUC Net Evaluated savings to estimate the interactive effect for each utility, using the following approach:

Interactive effect (therm/kWh) = Evaluated gas savings / Evaluated electricity savings

We multiplied this interactive effect by the annual electricity savings to estimate the gas savings (negative) per CFL per year: -0.25, -0.38, and -0.23 for PG&E, SCE, and SDG&E, respectively.

The difference in the approaches was in the treatment of bulbs that were rebated under the 2006-08 program, but installed during 2009 or 2010. The approaches are:

1. Savings is based on the estimated number of rebated bulbs that were installed by December 31, 2008. It excludes the benefits of bulbs that were sold but not installed by December 31, 2008 (29% of the total), and bulbs that were not sold by 2008 (5% of the total). Bulbs that were "leaked" to outside the IOU service territory (5%) and bulb sales that could not be verified (2%) are also excluded.<sup>12</sup> This is the approach adopted in the ULP report (the "adjusted quantity of measures rebated" approach).
2. Savings is based on the estimated number of rebated bulbs that are reasonably expected to be installed eventually in the service territory. This approach includes savings from bulbs that were rebated through the 2006-08 program and installed in

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<sup>10</sup> HMG changed the NTGR in the E3 calculator to the value used by the evaluators - 54%.

<sup>11</sup> Evaluated electricity and gas savings were taken from 06-08 Energy Evaluation Report Appendix A, for PGE 2000, SCE 2501, and SDGE 3016.

<sup>12</sup> Percentages for Leakage, Verification, and Sold through are based on SCE and SDGE values. These factors were aggregated into one number, 14.4%, for PG&E.



2009 or 2010. It excludes bulbs “leaked” to outside the IOU service territory, bulb sales that could not be verified, and bulbs in permanent storage (1%).

In the “CFL memo” released in January 2011, the CPUC’s evaluators recommended that PY 2009 energy savings include savings from bulbs rebated in previous program cycles (e.g., PY2006-08) and installed in program year 2009. Approach 2 would be another method for accounting for energy savings for bulbs rebated in one program cycle, and installed in another cycle. Note that only one of these approaches should be used, to avoid double counting savings.

## Results

The different approaches taken to estimate costs and benefits yield a range of net benefits and benefit-to-cost ratios, shown below.

Approach A1, NTGR=54%, should be the closest to the original evaluation.

Approach	Cost	Benefit	Net Benefits	Benefits / Costs
A1, NTGR=54%	\$464,681,251	\$448,839,297	-\$15,841,954	1.0
A1, NTGR=100%	\$464,681,251	\$831,183,883	\$366,502,632	1.8
B1, NTGR=54%	\$146,120,805	\$448,839,297	\$302,718,492	3.1
B1, NTGR=100%	\$166,662,419	\$831,183,883	\$664,521,464	5.0
A2, NTGR=54%	\$464,681,251	\$679,506,207	\$214,824,956	1.5
A2, NTGR=100%	\$464,681,251	\$1,258,344,828	\$793,663,576	2.7
B2, NTGR=54%	\$146,120,805	\$679,506,207	\$533,385,402	4.7
B2, NTGR=100%	\$166,662,419	\$1,258,344,828	\$1,091,682,408	7.6

*Figure 1- ULP Program costs and benefits*

## Discussion

Results show the large range of results from the different approaches taken, with the benefit-to-cost ratio ranging from 1.0 to 7.6. Major differences and similarities with the results are described below.

### Costs

For costs, there is a major difference in results using Approach A and B. By including the price of the equivalent number of incandescents offset by a CFL for the net participants, and the cost reduction of CFLs for free riders, the benefit-to-cost ratio increases by a factor of 3.

Note that the cost shown in Scenario B with NTGR=100% represents the cost if IMC is calculated as the price difference between one CFL (\$1.30) and the equivalent number of incandescents





that it replaces (net present value of \$3.48).<sup>13</sup> Because one CFL has a much longer lifetime, it replaces approximately 6.5 incandescents, yielding a negative IMC. Thus, Scenarios B1 and B2 reflect results if the IMC represents the equivalent number of incandescents replaced by a rebated CFL.

## Benefits

### *Bulbs installed in 2009 and 2010*

As described above, the evaluation report estimates that 40% of rebated bulbs were installed in 2009 and 2010. (The ULP report also includes trajectories of when program bulbs are installed, and predicts that almost all program bulbs would be installed by the end of 2010<sup>14</sup>). Therefore, inclusion of the savings from these bulbs results in an increase in total benefits of approximately 75% compared to the approach adopted in the evaluation study. Thus, including the energy savings of bulbs that will be installed in the IOU service territories after December 31, 2008, the benefit-to-cost ratio increases by over 50%.

Some of the rebated CFLs installed in 2009 and 2010 replaced bulbs – both CFLs and incandescents - that were working when the consumer purchased the rebated bulb, but which burned out in 2009 or 2010, prompting replacement. Given the 9.4 year life of a CFL (the Effective Useful Life, according to the E3 calculator), if the rebated CFL were replacing a burnt out CFL, the original CFL would have been installed around 2000, when the market penetration of CFLs was lower than present. This suggests that most of the rebated CFLs were replacing incandescents. More importantly, as described by the ULP report<sup>15</sup>, the watts savings does not depend on the prior condition (i.e., what the CFL replaces), but what would have been put in place otherwise.

### *NTGR*

The different NTGR's chosen here also had a major impact on the results. Because the lower NTGR analyzed here was almost half the other NTGR, estimates of total benefits varied by a factor of two.

NTGR is notoriously difficult to determine. The 06-08 evaluation team used various analytical methods, including surveys and interviews with suppliers, participants, and nonparticipants; and regression analysis to compare CFL purchases in California versus other states, to estimate a NTGR of 54%.

The 2010 CFL Market Profile found that 1 in 6.6 (15%) of medium screw-based lamps shipped today is a CFL<sup>16</sup>, and a significant fraction of these bulbs are incented through programs. Note that this does not represent free ridership, as the free ridership would equal the percent of

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<sup>13</sup> Because NTGR=100%, all participants are treated as net participants. Thus, there is no “weighted average” approach used to calculate the IMC, since there are no free riders.

<sup>14</sup> ULP report, p. 124.

<sup>15</sup> ULP report, p. 46.

<sup>16</sup> Energy Star CFL Market Profile, p. 8. See above for full citation.



those CFLs that consumers would purchase regardless of whether there are program incentives. But the low market share of CFL purchases indicates that the market is far from mature, and that consumers are still buying incandescents at > 5x the rate of CFLs.

### Comparison to original evaluation

In this analysis, Scenario A1, NTGR=54% was designed to reproduce the analysis done in the original evaluation. However, the benefit- to-cost ratio found here is lower than the benefit-to-cost ratio found in the original evaluation. The table below shows the benefits (in MWh) and the benefit-to-cost ratio (equivalent to the Total Resources Cost ratio - TRC) – estimated in this analysis and in the CPUC evaluation for comparison.

Program	CPUC Net Evaluated <sup>17</sup>		Scenario A1, NTGR=54%	
	Lifecycle Electricity Savings (MWh)	TRC (Benefit-Cost Ratio)	Lifecycle Electricity savings (MWh)	TRC (Benefit-Cost Ratio)
PG&E Res Mass Market (PGE 2000)	5,367,873	1.00	4,265,498	0.80
SCE Residential Incentive (SCE2501)	4,762,144	1.25	3,868,445	1.27
SDG&E Upstream Lighting (SDGE3016)	527,600	1.09	534,498	1.05

*Figure 2 – Comparison of CPUC Net Evaluated findings with Scenario A1*

One possible reason for the lower electricity savings estimated here for PG&E and SCE is that these were residential umbrella programs, which included components in addition to CFLs. Our estimate of program costs includes all costs (for CFLs and for other measures), but our analysis only includes benefits from the CFLs. Consequently, we underestimated the Benefit-to-Cost Ratio for the upstream lighting portion of these programs. This may also explain the discrepancy between our Benefit-to-Cost ratio and the TRC for PG&E.

This analysis also notes a discrepancy in the number of 06-08 program bulbs reported as installed for PG&E using the methodology described in the ULP Report section Adjustments to Quantity of Measures rebated (p. 36-41) - 27 million<sup>18</sup>, and the bulbs reported as installed for

<sup>17</sup> 2006-2008 Energy Efficiency Evaluation Report, Appendices A-J. Available: <http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/EM+and+V/2006-2008+Energy+Efficiency+Evaluation+Report.htm>

<sup>18</sup> Adjusted quantity of measures rebated equal program bulbs adjusted for leakage, verification, sold through rate, and installation; HMG followed this methodology for Approach 1.



PG&E in ULP Report Table 73 (p. 126) - 31 million<sup>19</sup>. In contrast, the number of bulbs estimated for SCE and SDG&E through the 'Adjusted Quantity of measures rebated' approach were very similar (< 2% different) to the number of installed bulbs reported in Tables 74 and 75, respectively.

## Overall Findings

While guidelines exist on how to conduct impact evaluations for energy efficiency program, there is still latitude on how to apply an evaluation methodology. This analysis shows how a series of policy and evaluation choices, such as:

- ◆ Only counting savings from measures rebated and installed in the same program cycle,
- ◆ Not counting the price of all base measures replaced by an energy efficiency measure, or treating the IMC for free riders the same as net participants,
- ◆ And applying a low NTGR,

produce a much lower benefits-to-cost ratio than what would be calculated using different choices. Through choosing numbers with a downward bias for each step in the process, the underestimated values compound, so that the estimated net benefits are several factors lower than what would be calculated using the approaches described above.

This analysis also illustrates the success of the 2006-08 Statewide California Residential ULP. For all scenarios considered, the benefit-to-cost ratio (equivalent to the Total Resource Cost test) is at least 1. For most scenarios, it is 2-5. For Scenario A1 (most equivalent to the evaluators'), the benefit-to-cost ratio is 1.0. The evaluators found this to be 1.1, indicating that this analysis slightly underestimates the benefit-to-cost ratio.

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<sup>19</sup> The numbers of installed rebated bulbs are very similar if nonresidential bulbs are included in the adjusted quantity of measures rebated, but this seems contrary to ULP Report, p. xi, footnote 2.